American Machinist

NOVEMBER 3, 1958 75¢

McGRAW-HILL MAGAZINE OF METALWORKING PRODUCTION

Job-testing Oxide Tools

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Hot cup–cold extrude 160-pound parts

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Shortcut saves special-tool drawings

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Contour roll complex shapes

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"Steering gear" guides bandsaw blade

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it's mainly a matter of TIMING!

Knowing WHEN to replace obsolete equipment with a new Heald Bore-Matic saved over $54,000 a year!

A MACHINE doesn't have to be very old in years to be obsolete as far as production costs are concerned. And after all, the purpose of any machine is not just to produce, but to produce at a *profit*.

That's why replacement timing is so important. It depends not only on the age and productive capacity of the old machine—but on a careful cost comparison between the old and the *new*. Such a comparison, in terms of investment and return, will tell you when equipment should be replaced, and when it should be retained.

Our sales engineers are well experienced in making such obsolescence studies—on Borizing and grinding equipment. And they will be glad to do the same for you. Similar studies have pointed the way to many important savings.

For Example: A manufacturer of aircraft control equipment purchased a Heald Model 222 Bore-Matic to replace older equipment for boring, turning, facing and grooving on a wide range of parts. Later, their engineers made a detailed analysis on 12 different parts, to evaluate its cost-saving performance in specific terms. It was found that the machine would save over $54,000 in production costs—not only *paying for itself*, but netting a *profit* of over $29,000 in just the first year! The cost comparison, by groups of parts, is shown below

	Old Method	New Machine
Annual Prod. Cost—Bodies	$53,004	$14,464
Annual Prod. Cost—Housings	18,124	4,917
Annual Prod. Cost—Carriers	3,276	1,404
Annual Prod. Cost—Plates	1,200	630
Total Cost per Year, all parts	$75,604	$21,415
Annual Saving for New Machine		$54,189
Total Purchase Price		$24,967
Net GAIN in One Year		$29,222

YOU pay for obsolescence. Replacement pays for itself!

THE HEALD MACHINE COMPANY

Subsidiary of The Cincinnati Milling Machine Co.

Worcester 6, Massachusetts

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American Machinist
McGRAW-HILL MAGAZINE OF METALWORKING PRODUCTION

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American Machinist chips

Oxides Applied . . . At Chrysler's Indianapolis transmission plant, oxides have been carefully tested, then put into full-time application on the production floor on tested applications. In Ben Brosheer's article you'll find how they have moved carefully into rather extensive application with gains in speed, quality, finish, and tool life. See page 108.

Packed Issue . . . This issue lies between two major projects: Plan '59 which appeared October 20 and the 8th Inventory which appears November 17. Each of these projects has seemed to take the full time of half the staff. We're not sure where the third half came from to produce this issue, but it is so packed with good ideas that we had trouble getting them all on the contents page. We can't begin to review them here, but this is a good time to remind you that even when there's space not all the articles get on the contents page. Late starters are always listed in the news index on the Spot News page. This time that's page 69.

Buyers' Guide Errata . . . In the Steel Warehouse listings in the AMERICAN MACHINIST Buyer's Guide (Mid-September, 1958), the gremlins were at work. An unfortunate printing error shifted several listings from Michigan to Pennsylvania. To make your copy accurate, please make these changes: On page K168 and K169 make a checkmark alongside the entries under "Erie, Pennsylvania" except the first and third (which properly belong there). Then on page K162 make a marginal note, "See K168 and K169 for added Detroit listings and for Flint."

Coming . . . *AM* for November 17 will contain answers a lot of people are now trying to pry out of us. It will contain the 96-page Eighth AMERICAN MACHINIST Inventory of Metalworking Equipment. Here will be the facts on how much, how old, and where on metal cutting, metal forming, welding, heat treating, cleaning and finishing, industrial trucks, and other shop equipment. We can tell you only this now: some of the results are truly startling.

Cover . . .

Automatic blade controller in use at Crucible Steel's Chicago warehouse. Details on this new steering gear for hacksaws are on page 96.

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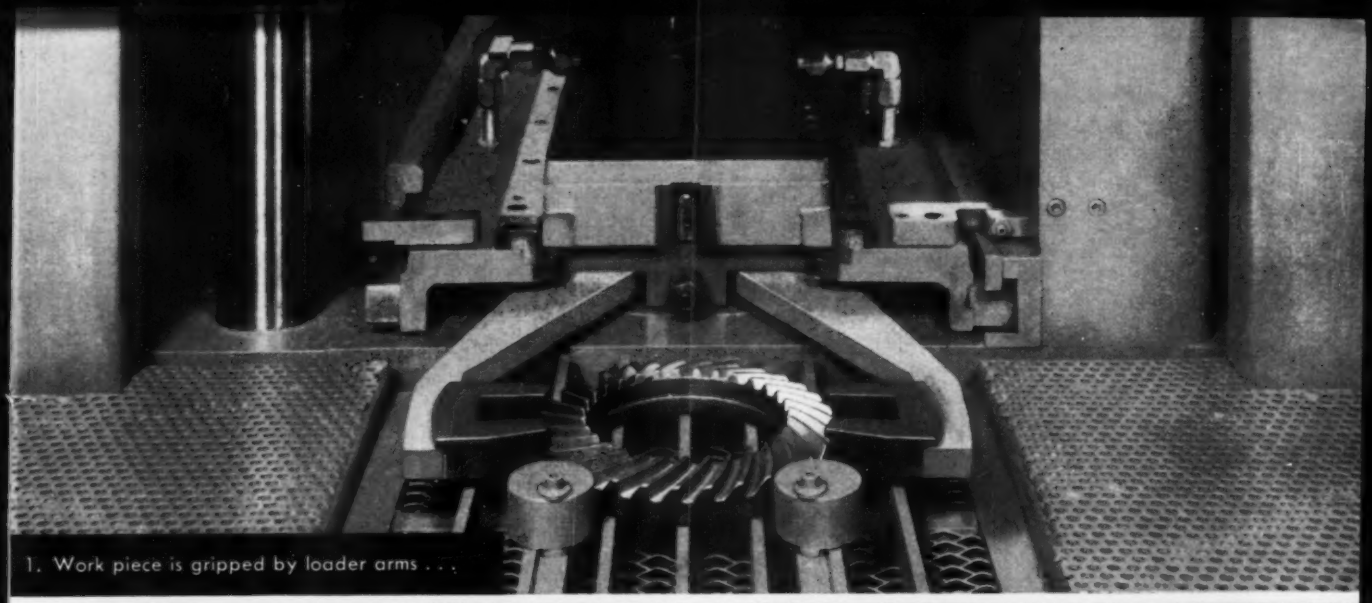


1. Work piece is gripped by loader arms . . .

2. . . . which move piece to quenching die . . .

3. . . . where controlled flexing relieves strains before quenching.

New Gleason machine quenches gears *3 times faster* with minimum distortion

The unique, fully automatic method incorporated into the new Gleason No. 117 Quenching Machine makes it possible to quench gears and other parts faster than ever before without significant distortion.

The machine discharges a piece every 30 seconds; accommodates 17 pieces in process at one time.

Automatic handling. Once a part is deposited at the front of the machine, the No. 117 positions it on a quenching die and then clamps, flexes, and quenches it. Initial quenching takes only about ten seconds.

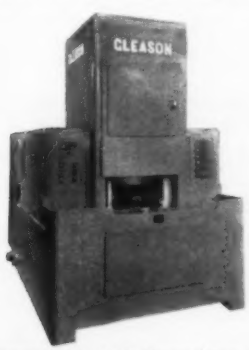
When the part cools past the critical hardening temperature, it is released from the dies. Still immersed in oil, the part then cools completely as it travels on a conveyor to the unload chute. As soon as part is released from dies, the machine is ready to receive another work piece.

Flexing before quenching. Each hot part is flexed between the dies to relieve internal stresses. Rate and number of flexes are easily preset. Hydraulic pressure produces positive diaphragming action.

Pulsing. All pressure on the work is pulsed momentarily throughout the die-quench. This permits work to contract without strain. During the die-quench, oil flows uniformly over and around the part.

Faster production. You can speed up production materially with the Gleason No. 117 Quenching Machine. It handles ring gears and cylindrical parts up to $10\frac{1}{2}$" in diameter and 8" high. You can connect it with any conventional furnace so that parts are automatically fed to the quenching press. Push-button controls and timers are adjustable and easy to set. Dies can be changed quickly and easily.

Gleason engineers are ready to help you step up productivity with this new machine. For complete details, write for bulletin.



Gleason No. 117 Quenching Machine

GLEASON WORKS

Builders of bevel gear machinery for over 90 years

1000 UNIVERSITY AVE., ROCHESTER 3, N.Y.

CIRCLE 201 READER SERVICE CARD

Cutting deeply through metal and costs is easy for the big Dial Types. Amount of metal removed during the milling operation (oil well equipment parts) is indicated in the drawing. Machine: No. 5 Vertical Dual Power Dial Type, 50 hp drive.

CINCINNATI® Knee Type Milling Machines • Bed Type Milling Machines

CIRCLE 202 READER SERVICE CARD

Types are Tops in MILLING Large Parts ... and taking DEEP CUTS in Metal and Costs

Working range and cutting capacity are on a big scale in the big CINCINNATI High Power and Dual Power Dial Type Milling Machines. And cost performance is on a big scale, too; production costs are much lower than obtainable with older shop equipment. The brief statistics listed below tell why:

Extra large working surface and range —1890 and 2090 square inches working surface; 50" and 60" table traverse, respectively, for the Nos. 5 and 6 sizes (three smaller sizes also available).

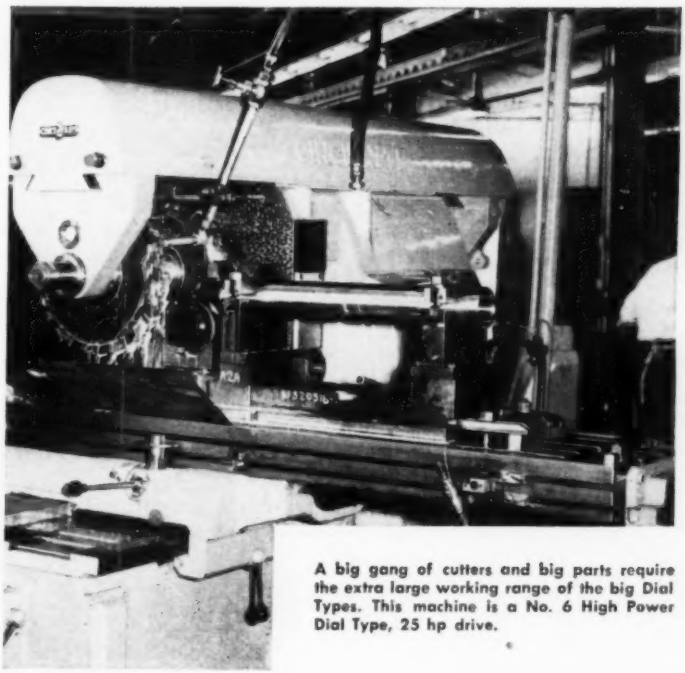
Powerful drive — 50 hp motor for the larger sizes.

One lever, power selection of speeds and feeds.

Dynapoise overarm — smooths out the cutting action.

Automatic backlash eliminator — automatically engages only while the cutter is removing chips.

These and other advantages give the CINCINNATI High Power and Dual Power line the highest replacement value for old knee type milling machines now inadequate for heavy duty toolroom and production milling. Brief specs are tabulated below and complete details are contained in catalog No. M-1917-4. Write for a copy or telephone Cincinnati RE 1-2121.



A big gang of cutters and big parts require the extra large working range of the big Dial Types. This machine is a No. 6 High Power Dial Type, 25 hp drive.

Brief specs — CINCINNATI High Power and Dual Power Dial Type Milling Machines

Size	No. 2	No. 3	No. 4	No. 5	No. 6
Styles	*Plain Univ. *Vert.	*Plain Univ. *Vert.	*Plain Univ. *Vert.	*Plain Univ. *Vert.	*Plain *Vert.
Spindle speeds	16-1600 rpm	16-1600 rpm	14-1400 rpm	14-1400 rpm	14-1400 rpm
Feeds	3/8-90 ipm	3/8-90 ipm	3/8-90 ipm	3/8-90 ipm	3/8-90 ipm
Spindle drive					
High power	15 hp	20 hp	25 hp	25 hp	25 hp
Dual power	20 hp	30 hp	50 hp	50 hp	50 hp

*Automatic table feed cycles are included with Plain and Vertical machines

CINCINNATI

Die Sinking Machines • Cutter and Tool Grinders

MILLING MACHINE DIVISION
The Cincinnati Milling Machine Co.
Cincinnati 9, Ohio

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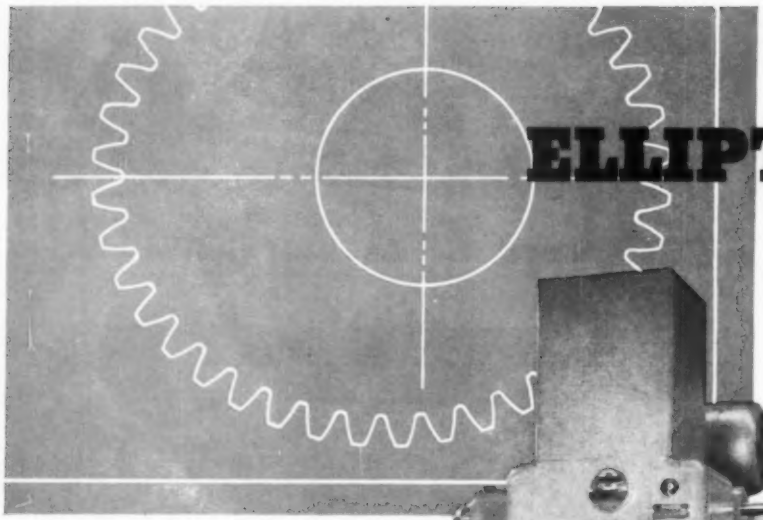

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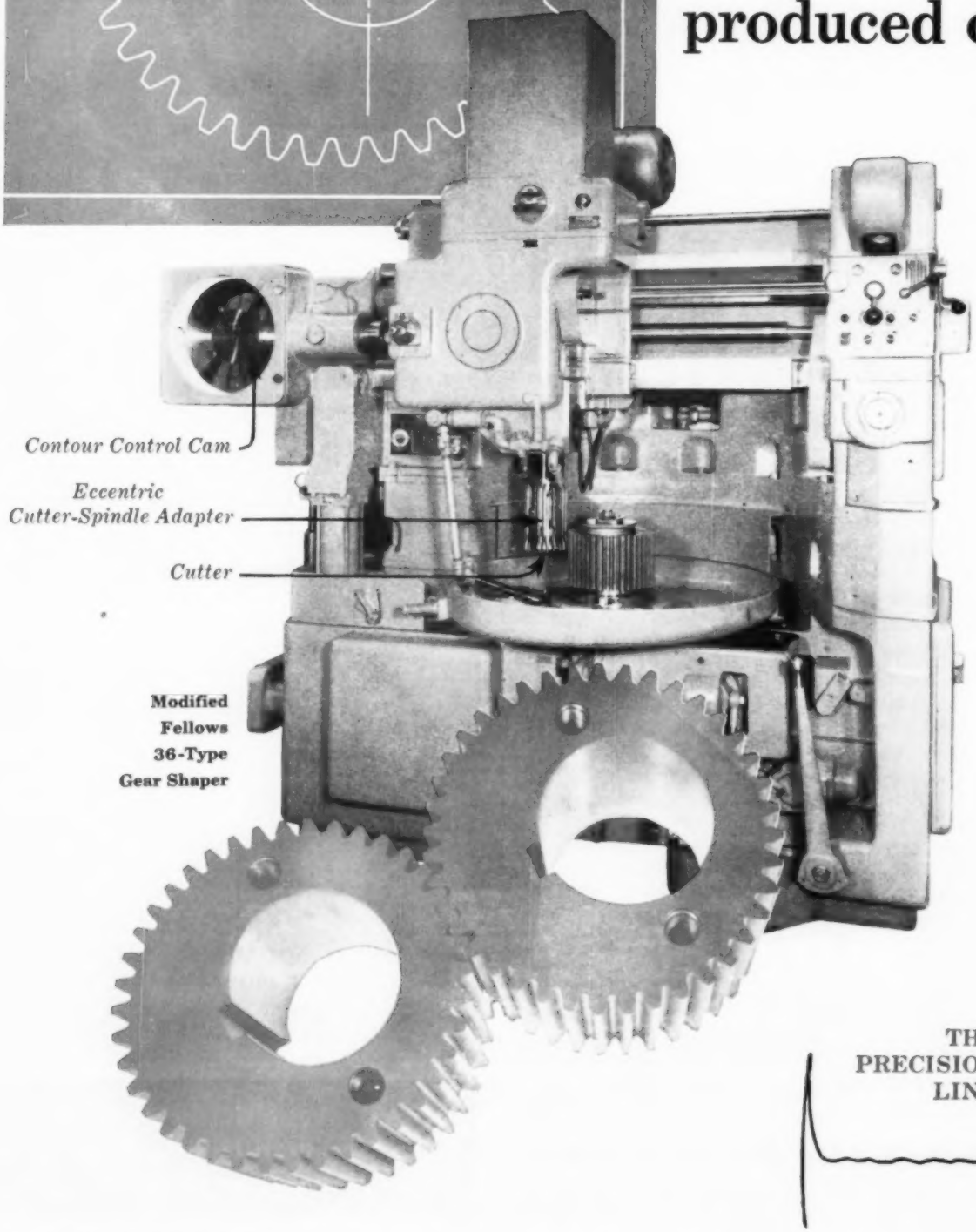

THE
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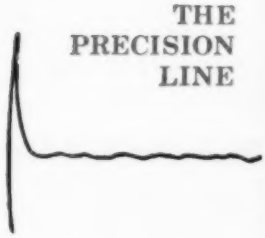


6 CIRCLE 204 READER SERVICE CARD American Machinist • November 3, 1958

OVAL GEARS

Fellows 36-Type Gear Shaper

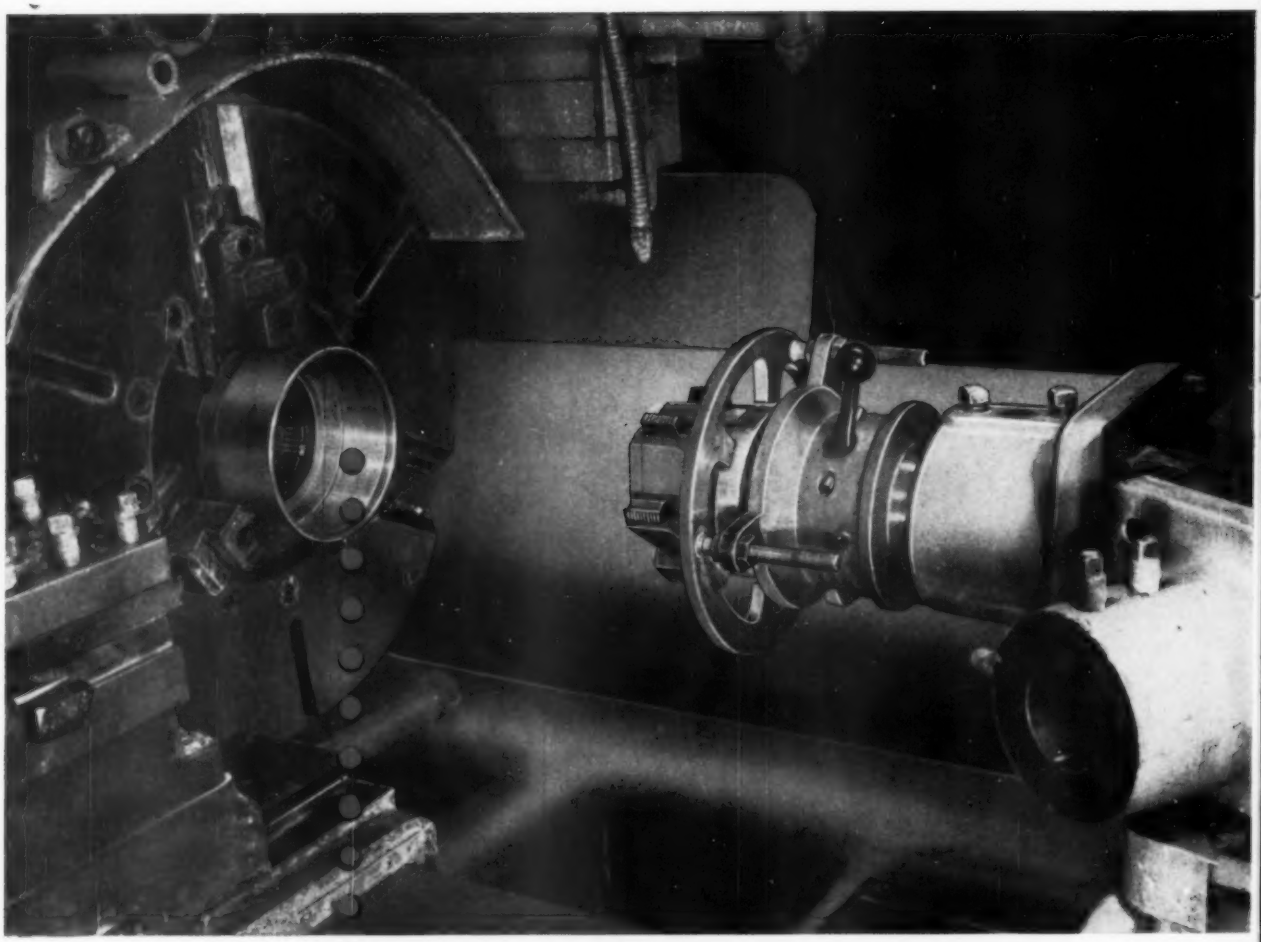
Now... you can generate accurate oval and elliptical gears, and other irregular shapes, rapidly and economically. Once setup is made, production is as simple as in cutting conventional cylindrical gears. This new method minimizes the difficulty of wide variations in backlash experienced with such gears cut by previous methods. Full or modified involute teeth are produced to a higher degree of accuracy than was ever possible before on gears of this type.

Oval and elliptical gears are produced by continuously varying the center distance between cutter and gear during the cutting operation. A contour cam and a follower move the saddle the required amount in timed relationship with the rotation of the eccentric cutter-spindle adapter. The required pitch line contour of the gear is determined by the control cam and the eccentric adapter.

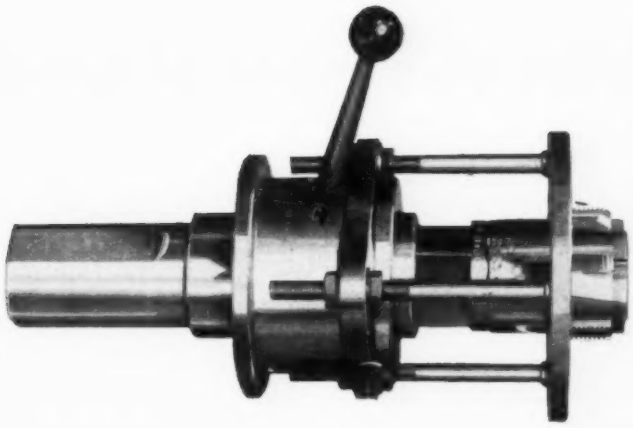
Although the Modified 36-Type Gear Shaper can be used to produce conventional external gears up to 18″ pitch diameter by substituting a cylindrical cam and concentric cutter adapter, it is primarily a special purpose machine for oval and elliptical gears. Special stroke parts are required for cutting face widths from 6″ to 10″. For full information, get in touch with any Fellows office.

THE FELLOWS GEAR SHAPER COMPANY
78 River Street, Springfield, Vermont
Branch Offices: 1048 North Woodward Ave., Royal Oak, Mich.
150 West Pleasant Ave., Maywood, N. J.
5835 West North Avenue, Chicago 39
6214 West Manchester Ave., Los Angeles 45

Fellows *Gear Production Equipment*



tapping 7-5/8" threads in tough steel



Rugged construction, allowing heavy metal removal in one pass, is one of the reasons a LANDIS Collapsible Tap is used to thread cylinder retainer caps for heavy duty hydraulic cylinders at the Cleveland Hydraulic Co., Bedford Heights, Ohio.

A LANDIS 6ALT Tap with a 7″ head is mounted on a turret lathe for threading 40-50 carbon cast steel normalized from 1600° to 1750°. 7⅝″ 8-pitch UN threads are tapped $2\frac{3}{16}$″ long to Class 2 fit.

Another outstanding feature of the LANDIS ALT Collapsible Tap is the detachable head, permitting the use of tap heads of various sizes and capacities on the same tap body. For example, on the 6ALT illustrated, five heads will allow a threading range 6½″ to 13¼″. In addition, each tap head has a relatively wide threading range — the 7″ head shown here threads all diameters from 6½″ to 8″. Thus, as a result of the minimum equipment required for such wide range coverage, low initial cost and continuing economy of tooling are assured.

LANDIS ALT Taps may also be used to produce taper threads, with chasers cutting across their entire width if required. For more complete information on the various sizes of ALT Taps for threading all diameters from 1¼″ to 13¼″, write for Bulletin G-94.

499C

the world's largest manufacturer of threading equipment

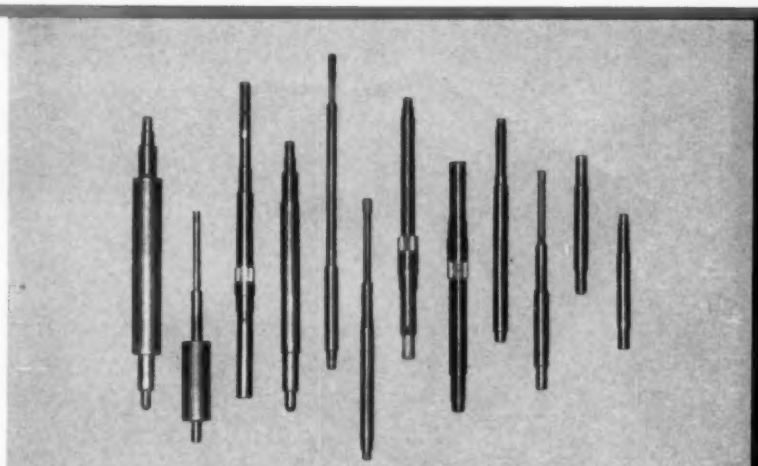
LANDIS *Machine* COMPANY

WAYNESBORO • PENNSYLVANIA

CUTTING • GRINDING
ROLLING • TAPPING

Accuracy and speed of Landis plain grinders

Since the addition of two Landis 4'' Plain Grinders in the grinding department of a midwestern electric company, overall grinding costs on motor shafts have shown an appreciable drop. Production has been stepped up and at the same time rejects have been substantially reduced. Close tolerances of .0002'' are easily maintained with finishes meeting all requirements consistently.



Landis 4" x 18" type H plain hydraulic grinder

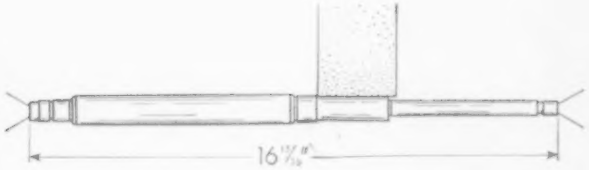
LANDIS TOOL COMPANY

CIRCLE 208 READER SERVICE CARD

cut unit costs in grinding motor shafts

Profitable production. Fast change of setup on the new Landis Grinders means more production time. Twelve electric motor shafts of varying diameters are ground in this department.

Close tolerances. Accuracy to "tenths" consistently maintained on infeed and traverse grinding operations.



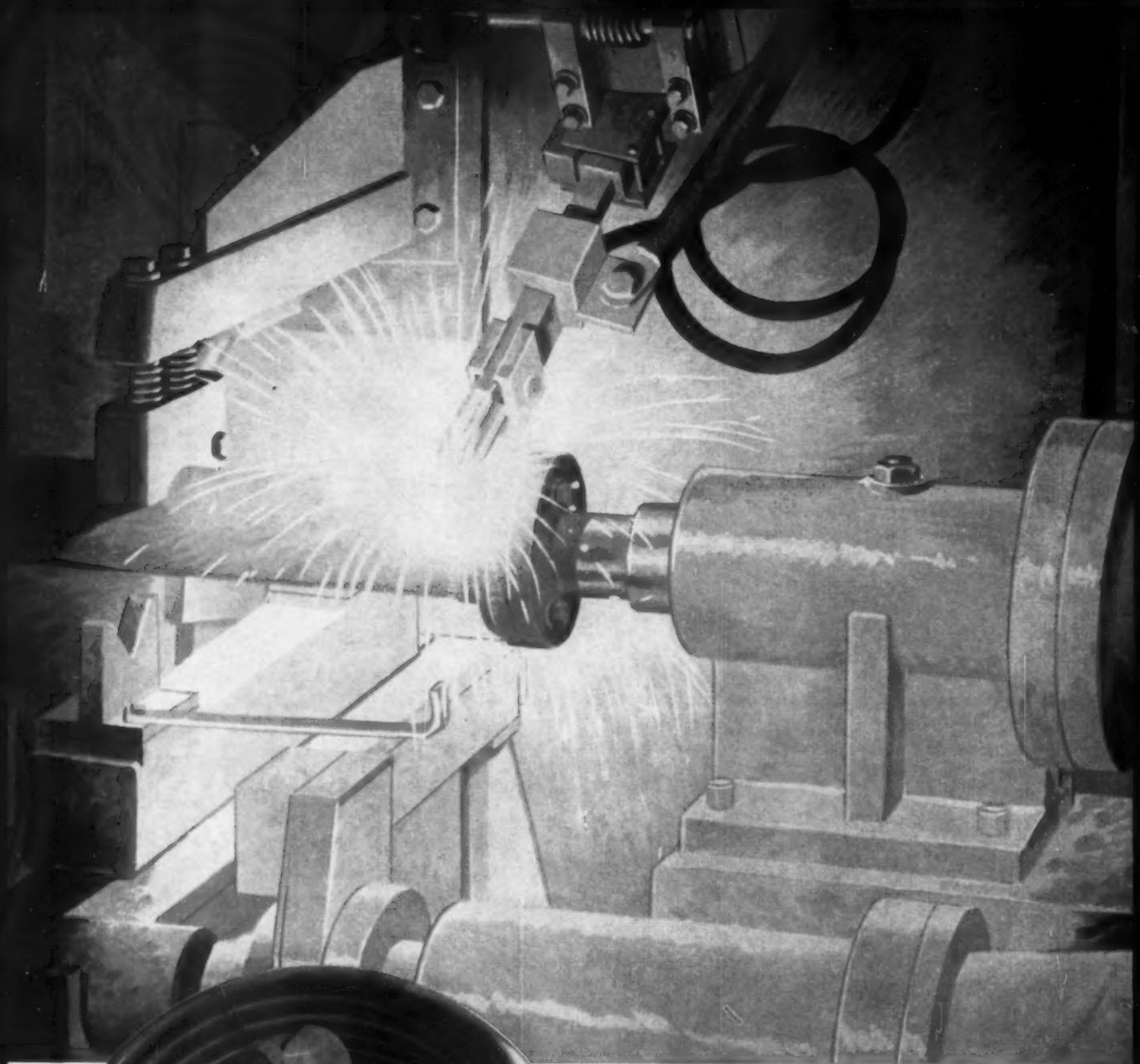
production data

Operation:	Infeed and traverse grinding diameters of motor shafts
Machines:	Landis 4'' type H plain grinders
Production:	From 70 to 140 parts per hour depending on size
Material:	1117 cold rolled steel and free machining stainless steel type 416
Stock removal:	.012'' to .015'', finishing
Finish:	16 to 30 RMS
Tolerance:	Range from .0002'' to .0005'' on diameter depending on the shaft being ground

WAYNESBORO, PENNSYLVANIA

LANDIS
precision grinders

CIRCLE 209 READER SERVICE CARD



West-Ing-Arc® Dynamic Reactor greatly enlarges the fields of applications for welding and results in many "plus" benefits at a small investment to the user of any semiautomatic or fully automatic welding process equipment employing constant potential (voltage) power source.

If you presently use West-Ing-Arc equipment, or contemplate its use—the addition of the Dynamic Reactor results in cost-cutting extras . . . in addition to the efficiencies already inherent in the West-Ing-Arc process.

Order this versatile addition to your present equipment *now!* Or write for complete details on how this equipment can result in savings. Address: Dynamic Reactor, Welding Division, Westinghouse Electric Corporation, 4454 Genesee Street, Buffalo 5, New York. J-22140

YOU CAN BE SURE...IF IT'S Westinghouse

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CIRCLE 210 READER SERVICE CARD

A "triple cost-cutting" **EXTRA** for welding mild steels, stainless and aluminum

The **NEW** WEST-ING-ARC®

DYNAMIC REACTOR

FOR USE WITH AUTOMATIC AND SEMIAUTOMATIC GAS SHIELDED, DC WELDING EQUIPMENT UTILIZING CONSTANT POTENTIAL POWER SOURCES

"ALL-POSITION" WELDING!
Overhead—vertical up—and down! Stability of arc at reduced setting.

REDUCED ELECTRODE WIRE COSTS!
Use at least one size larger diameter wire with no change in current setting, voltage or feed speed. Cost reductions from 1¢ to 17¢ per pound of deposited weld metal.

GREATER VERSATILITY!
Light-gauge metals now may be arc welded. No slag removal problems; practically no "spatter" . . . finished products are ready to paint or plate. CO_2 gas shielding for mild steel hand gun welding is practical!

STYLE 565D956G01

STYLE 427C503G01

2 LOW-COST, DUAL-RATED MODELS

- Style 427C503G01—150/300 amperes 100% duty cycle—Zone 1 price* **$159**
- Style 565D956G01—300/600 amperes 100% duty cycle—Zone 1 price* **$259**

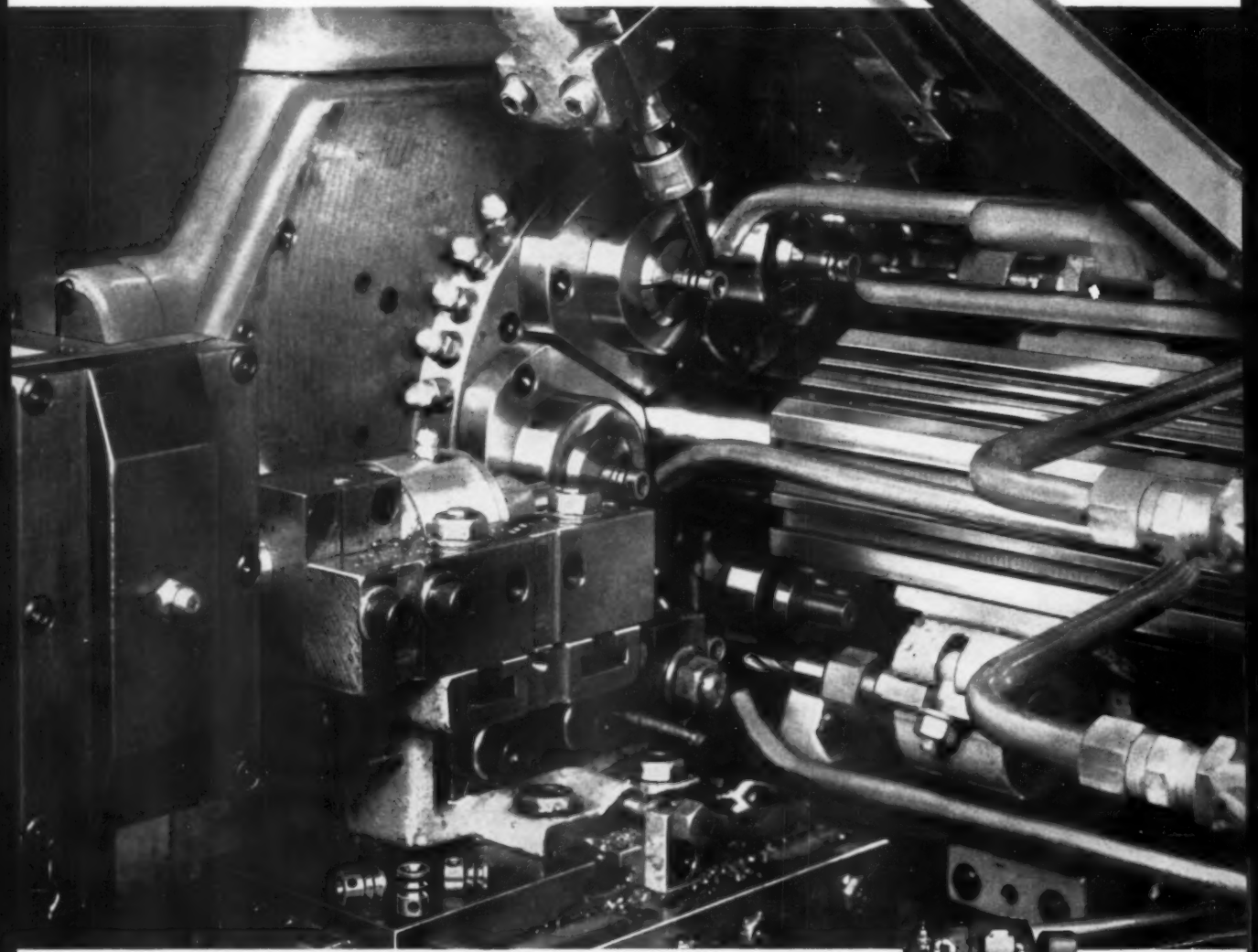
*Slightly higher in Zones 2 and 3

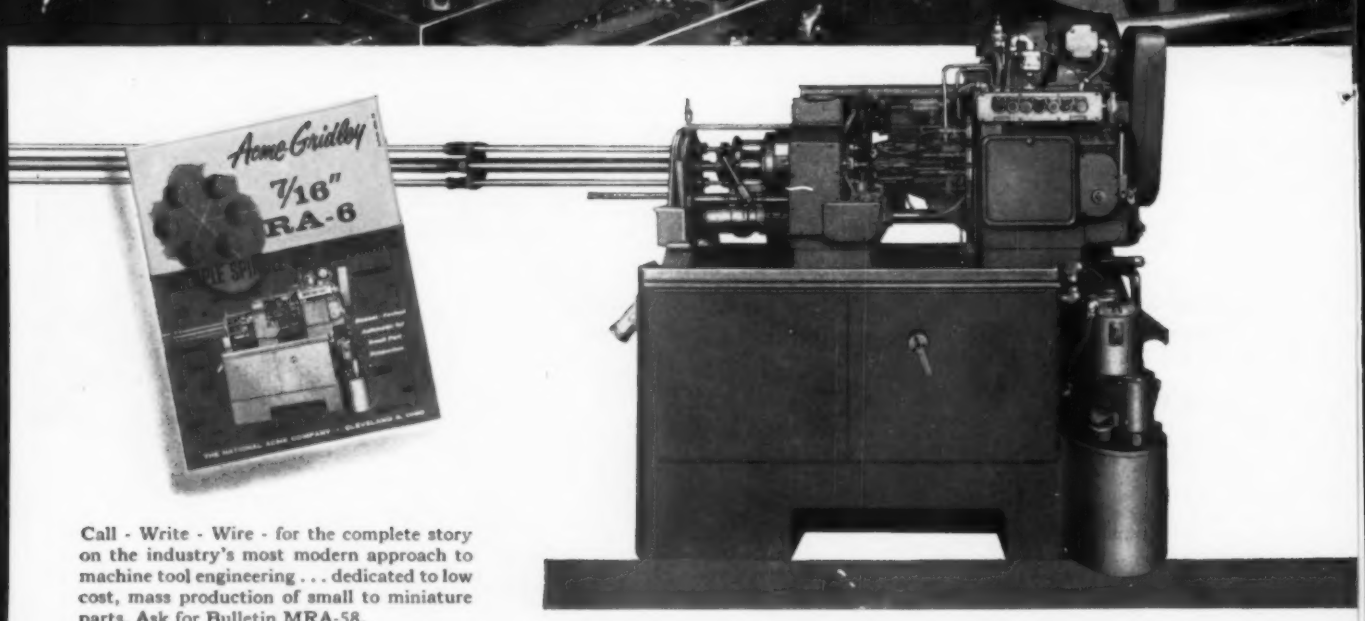
ORDER NOW!

Watch Westinghouse for New Developments in Welding!

CIRCLE 211 READER SERVICE CARD

Unusually large tooling zone permits ready access for installation and adjustment of tools and attachments.





Call - Write - Wire - for the complete story on the industry's most modern approach to machine tool engineering . . . dedicated to low cost, mass production of small to miniature parts. Ask for Bulletin MRA-58.

CIRCLE 212 READER SERVICE CARD

THE 7/16" SIX.....

NEW ACME-GRIDLEY CONCEPT IN MULTIPLE SPINDLE AUTOMATICS

Longer runs without adjustment . . . greater sustained accuracy at lower cost . . . than any comparable machine in the industry!

. . . and we can prove it!

- **6 PRECISION SPINDLES**
  speeds up to 5200 r.p.m.
- **POSITIVE, DIRECT CAMMING**
  assures lasting accuracy
- **INDEPENDENTLY OPERATED TOOLSLIDES**
  greatly increase flexibility
- **RIGID, BOX-TYPE FRAME**
  provides the "beef", properly distributed that contributes to consistent accuracy at continuous high speeds

Remember...when you buy an Acme-Gridley 7/16" Multiple Spindle Bar Automatic, you're getting the newest, smallest, fastest machine from the world's *only* complete line of multiple and single spindle bar and chucking automatics. We've been making and improving them for 60 years . . . we think we know how!

National Acme

THE NATIONAL ACME COMPANY, 171 E. 131st ST., CLEVELAND 8, OHIO • Sales Offices: Newark 2, N.J., Chicago 6, Ill., Detroit 27, Mich.

CIRCLE 213 READER SERVICE CARD

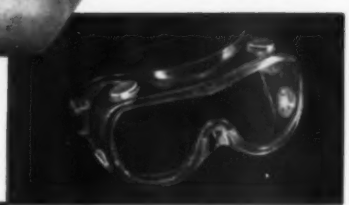
Give your men the Protection and Comfort of AO's NEW FLEXIBLE MASK GOGGLE SERIES

Eye Protection

Here's a great new *series* of light, comfortable, flexible mask goggles which retain the comfort of the previous series — with a smoother face — hugging fit at the nose and temples! Particularly noteworthy is the LARGER, MUCH DEEPER MASK — affords greater protected area and fits easily over Rx and personal glasses. Lens is interchangeable, one-piece acetate curved slightly for wider vision. Headband is easily adjustable elastic.

482A — clear frame, clear or green lens. (483A with green frame). For protection against flying particles in babbitting, chipping, cutting rivets, light grinding, hand or machine tool work or where spark-explosion hazards exist. Note ample perforations for ventilation.

482A — For Impact Protection



484A — For Chemical Splash Protection

484A — Basic structure similar to the 482A but with four ports (instead of perforations). Provides safe indirect ventilation and anti-fogging while protecting against chemical splashes. Resistant to acids and alkalies. Clear frame, clear or green lens. (485A with green frame).

Deeper cup — increased lateral protection. Easily fits over safety Rx and personal glasses.

486A — For protection against dangerous light rays, glare, flying sparks and scale in acetylene welding, cutting, burning, brazing and furnace work. Has black lens adapter which takes the standard AO lens and regular 50mm. round filter lenses and cover lenses. Goggle has Noviweld filter lenses, shades 3, 4, 5, 6. For chipping and grinding, companion Model 489A comes with clear frame, clear transparent adapter and Super-Armorplate lenses.

Modified nosepiece. Aids comfort and fit.

487A — Similar to our 483A except for ***transparent*** green frame. For maintenance men, truck drivers and factory workers where glare from overhead lighting is a problem and where impact protection is needed.

Always Insist on the AO Trademark on Lenses and Frames

American Optical
COMPANY
SAFETY PRODUCTS DIVISION

SOUTHBRIDGE, MASSACHUSETTS
Safety Service Centers in Principal Cities

1833-1958 • 125 LEADERSHIP YEARS

Conduit box can be located top, bottom, or either side.
Control hand wheel can be positioned on top or either side.
All end-bracket assemblies are interchangeable for repositioning of drive components.
Output shaft can be high or low, right or left.
Motor can be mounted top or bottom.
Detachable feet can be bolted to bottom, side, or top for floor, wall, or ceiling mounting.

GET ALL THESE VARIATIONS FROM ONE BASIC DESIGN

— with wrench and screwdriver!

The ALLISPEDE* DRIVE gives you complete field versatility!

It's the most flexible and precise mechanical adjustable speed drive made . . . and the only one that can be fully adapted in the field!

The *all-new* ALLISPEDE DRIVE is the answer to any motor application that calls for low-cost adjustable speed. It permits smooth, easy speed adjustment — and maintains it exactly. Its modern design permits unusual field-flexibility — lets the user change the unit *any time* to suit his various requirements.

The a-c ALLISPEDE DRIVE is the *only* drive that can be fully adapted in the field by the user. The basic unit goes together like building-blocks . . . feet, end brackets, control hand wheel, conduit box, and output shaft can be relocated in minutes to fit existing space limitations. The same unit can be changed from an upright to a horizontal drive for floor, wall or ceiling mounting. And all you need is a wrench and screwdriver!

Superior design improves drive efficiency and extends service life. The four bearings equally distribute belt load, increasing bearing and belt life. Movable discs slide smoothly on internally-lubricated splined shafts — won't stick in place or wear. Belt changes are faster — never disturb the dial or adjustment mechanism. Rugged cast-iron housing with plated steel covers shields drive against dirt and corrosion . . . integral rotor fan cools the motor and force-ventilates the drive housing to extend bearing life. Oversize cartridge bearings are pressed on shaft and lubricated at the factory. Corrosion-resistant stainless steel nameplates diagram proper motor connection, specify bearing sizes, and carry complete instructions for operation and lubrication.

The ALLISPEDE DRIVE can be supplied with in-line or right-angle integral gears, brake and tachometer. Sizes from 1 to 20 HP with speed variations up to 8:1. Electrical and mechanical modifications are available to meet special requirements for any application.

Contact your Louis Allis District Office or Distributor for complete information and engineering assistance. Or write for Bulletin 3300, The Louis Allis Co., 452 E. Stewart Street, Milwaukee 1, Wisconsin.

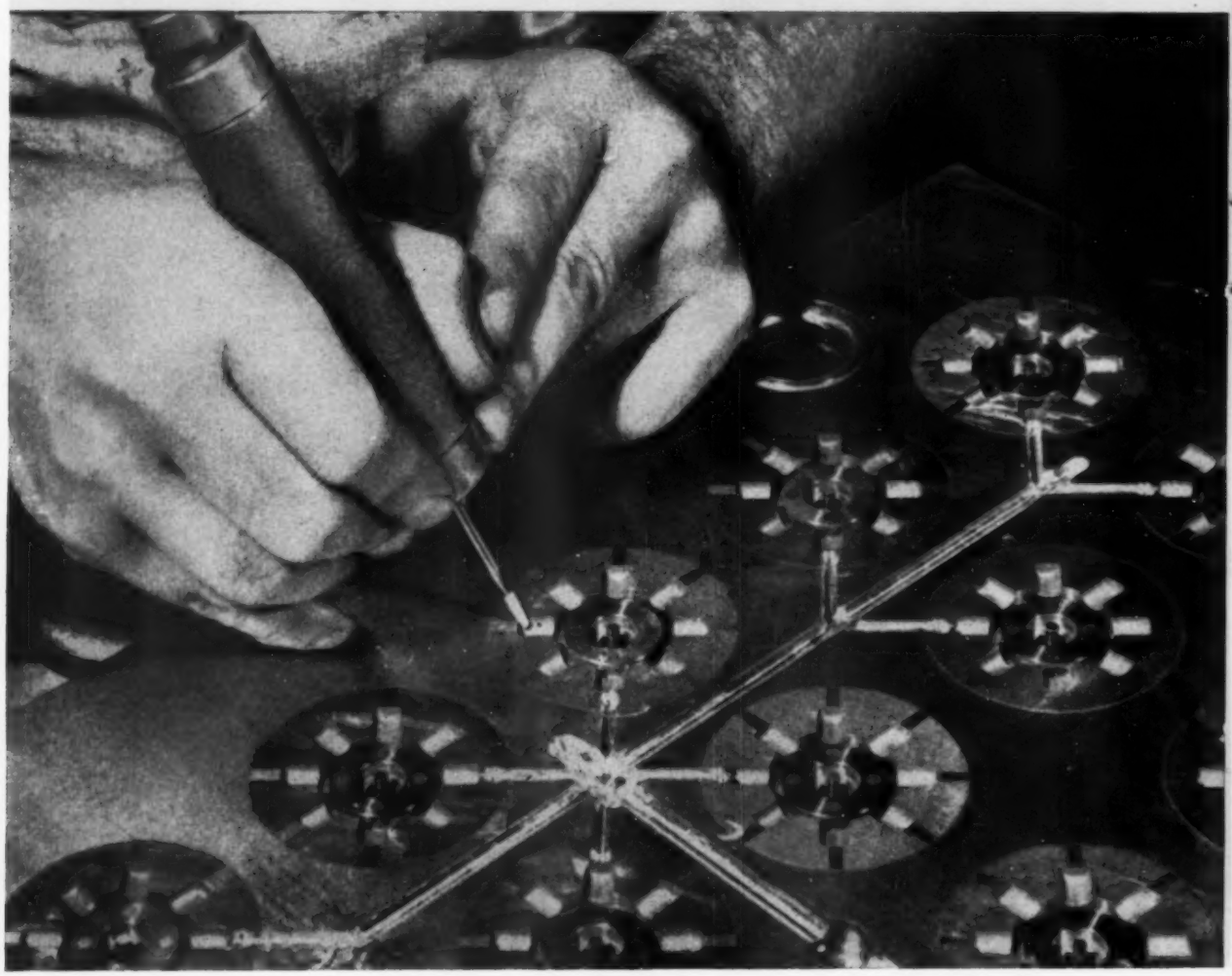
**ALLISPEDE is a trademark of The Louis Allis Co.*

ASD-116

LOUIS ALLIS

MANUFACTURER OF ELECTRIC MOTORS AND ADJUSTABLE SPEED DRIVES

32 ALUNDUM Abrasive for your tool and die jobs*



Here's how Norton keeps

"Making better products... to make your products better"

Our motto is constantly being proved by our customers. Norton mounted wheels, for example, are hitting new highs in grinding efficiency. Outstanding new developments in abrasives and wheel construction eliminate loading and glazing, assuring best possible results in:

TOOL AND DIE GRINDING

Norton mounted wheels with sharp 32 ALUNDUM abrasive and VBE bond are the very best performers.

Advantages: Wheels need no costly dressing, hold form and give constant cutting action from start to finish — right down to the mandrel. "Best I ever had," reports a long experienced die finisher.

ROUGH GRINDING

For steel castings and weldments, mounted wheels of tough 44 ALUNDUM abrasive with VBE bond, and metal-mounted, are unequalled.

For snagging cast iron, wheels of sharp 32 ALUNDUM abrasive with VBE bond, and metal-mounted, outperform silicon carbide wheels consistently.

Advantages: Norton wheels give you the fastest cutting rate, with a marked increase of stock removed per wheel. "There has never been anything like them for speed and economy in our snagging," says the foreman of a leading foundry.

32 or 44 ALUNDUM Abrasive for your rough grinding

METAL-MOUNTING — *Another Norton Exclusive — You throw nothing away but the mandrel!*

Norton does it again! The mounted wheels are so securely anchored to the mandrel — *you use all of the abrasive!* No waste . . . all work! This radically improved method of locking the abrasive body to the mandrel is used on mounted wheels in most sizes and shapes, 5/16" diameter and larger. Molten metal, injected into the abrasive recess at high pressure, does it — and does it fine!

Every Norton mounted wheel is accurately trued *after mounting* on rust-proof stainless steel mandrels. Developed to increase the time-and-money-saving "Touch of Gold," Norton mounted wheels are stocked in approximately 200 standard shapes and sizes. See your Norton Distributor for prompt deliveries. Or write to NORTON COMPANY, General Offices, Worcester 6, Mass. Plants and distributors around the world.

*Trade-Mark Reg. U. S. Pat. Off. and Foreign Countries

NORTON ABRASIVES

W-1879

Making better products . . . to make your products better

NORTON PRODUCTS Abrasives • Grinding Wheels • Grinding Machines • Refractories • Electrochemicals — BEHR-MANNING DIVISION Coated Abrasives • Sharpening Stones • Pressure-Sensitive Tapes

NOW MORE THAN EVER

MARVEL HIGH SPEED EDGE HACK SAW BLADES

should be YOUR FIRST CHOICE

This is no time for "second-best" performance from your hack sawing machines. Today, every cut you make on a hack saw should be done as quickly, accurately, and economically as possible.

The *blades* you use can often mean the difference between mediocre work and top performance from your hack sawing machines. Here are 3 big advantages unbreakable MARVEL High-Speed-Edge Hack Saw Blades can bring to your cutting-off operations:

1 HIGHER PRODUCTION . . .

MARVEL High-Speed-Edge Blades are shatterproof and can be worked harder and faster than any other blade. They will withstand the highest speeds and heaviest feeds attainable on any hack sawing machine with complete safety. Machine operators working with MARVEL Blades naturally apply greater tensions, feeds, and speeds because they know they are safe from personal injury accidents. The result is faster cutting-off.

2 GREATER ACCURACY . . .

MARVEL Blades can be safely tensioned from 200% to 300% more taut than ordinary blades. Higher blade tensions produce greater rigidity of the high-speed-steel cutting edge, resulting in maximum attainable accuracy of cut-off blanks.

3 LONGER BLADE LIFE . . .

Each MARVEL High-Speed-Edge Hack Saw Blade is triple tempered to assure maximum toughness of the cutting edge. MARVEL Blades not only give you longer life, they assure a more efficient cutting life and lower blade costs.

Why gamble? Demand MARVEL Blades by name, and be sure you're getting the best blades on the market. Leading Industrial Distributors have them in stock.

B-1123

Write for the new MARVEL Cutting Tool Bulletin and the name of your nearest MARVEL Distributor.

ARMSTRONG-BLUM MFG. CO.
5700 BLOOMINGDALE AVE. • CHICAGO 39, ILLINOIS

MARVEL Metal Cutting SAWS
Better Machines–Better Blades

Check...

COST-PER-PIECE

...it's usually LESS on the

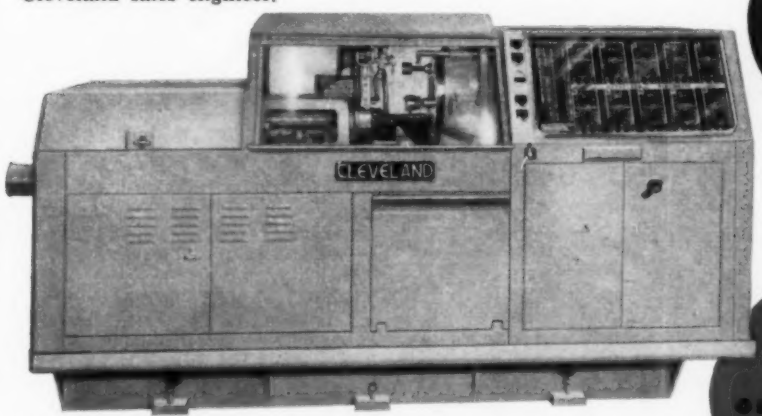
NEW 1⅜" or 1⅝" model AB

CLEVELAND DIALMATIC

Analyze each of your jobs on its own. Figure it on a new 1⅜" or 1⅝" Model AB Cleveland Dialmatic single spindle automatic, and compare the best other methods you can use. Chances are you will get a much lower unit cost on the Cleveland—even on runs as small as 50 pieces!

Dial control is the answer. With this new Cleveland you save set-up time because there are *no change gears, no special cams to install.* You simply *set the dials* to pre-select any tool feed or spindle speed that you want, forward or reverse, for each of the five turret positions . . . the *exact* feeds and speeds for all types of tools, all kinds of metals. Then set the timing dogs and you are programmed for fully automatic machining—faster, more accurate production with fewer rejects.

Apply the many cost-cutting features of the new Model AB to your jobs. Get full information—write for the new 1⅜" and 1⅝" Model AB Cleveland Bulletin, or, better still, get in touch with a Cleveland sales engineer.



STAINLESS?

TIP ⅜" diameter, 416 stainless steel. 107 pieces per hour gross on 1⅜" Model AB. 6 operations include taper turn, end form, thread roll.

TOUGH ALLOY?

PILOT 1⅛" diameter x 4⅛" long, SAE 8620 steel. 15 pieces per hour gross on 1⅜" Model AB. 7 operations include box mill, cross turn, thread.

MILD STEEL?

HOUSING 1½" diameter, SAE 1020 steel. 15 pieces per hour gross on 1⅜" Model AB. 6 operations include heavy drill, deep form, tap.

BRASS

THREADED BUSHING ⅝" hex, free machining brass. 225 pieces per hour gross on 1⅜" Model AB. 7 operations.

or ALUMINUM?

RETAINER 1½" diameter, 245-T4 aluminum. 65 pieces per hour on 1⅜" Model AB. 7 operations.

ONLY the 1⅜" and 1⅝" Model AB CLEVELAND DIALMATICS provide—

EXACT SPINDLE SPEEDS—infinitely variable between 40 and 3200 rpm. Automatic changes and reversals.

EXACT TURRET FEEDS—actually **tuned** to each cut. No cam changes with Cleveland's universal camming.

OTHER PRODUCTIVITY FEATURES—independently controlled front and rear cross slides . . . independent cutoff slide . . . easy handcrank adjustment of stock feed . . . quick-change collets and feedshells . . . only 6.3 second idle motion time . . . Geneva turret indexing mechanism . . . and a host of other design features which assure long-lived accuracy—low maintenance costs.

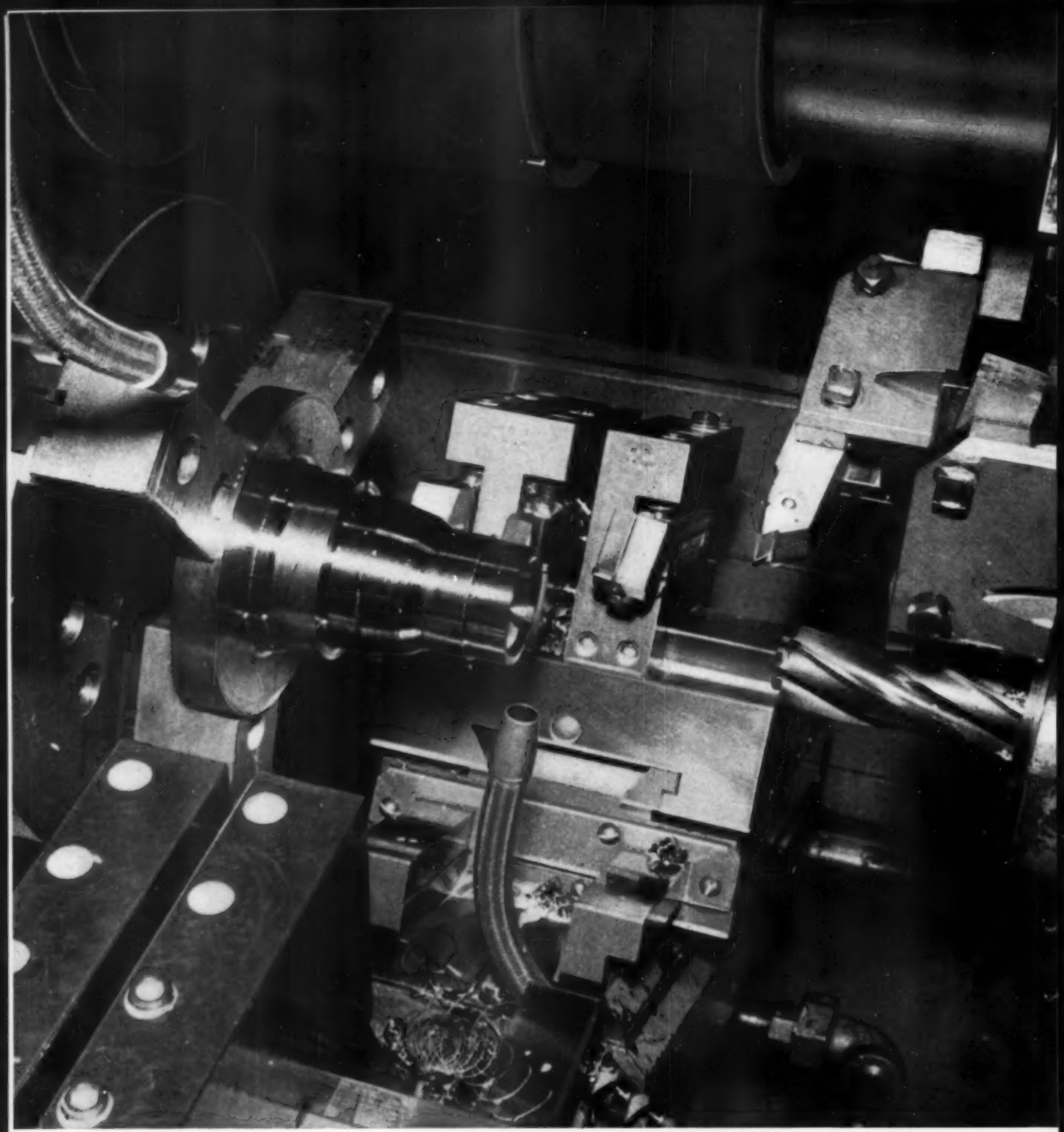
Remember,
CLEVELANDS CUT COSTS!

THE CLEVELAND AUTOMATIC MACHINE COMPANY

4928 Beech Street
Cincinnati 12, Ohio

SALES OFFICES: CHICAGO
CLEVELAND • DETROIT
HARTFORD • S. ORANGE

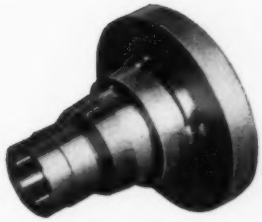
Manufacturers of a Complete Line of Single Spindle Automatic Screw Machines and High Pressure Hydraulic Die Casting Machines



Tooling stations with room to work permit time-saving multiple cuts to be set up easily, quickly on Warner & Swasey ACs. In this close-up photo of three stations on the first chucking of the 325-Stainless Steel nozzle, eight cutters are shown — three on the rear cross slide, two on the front cross slide and three in the turret station. The entire setup employs 16 cutters in seven stations. The skill and know-how of Crosby's own organization has handled the complete tooling of well over 100 similar parts — a tribute to the ease of tooling ACs to produce complicated parts in tough materials to close tolerances and fine finishes.

CIRCLE 220 READER SERVICE CARD

At Crosby Valve & Gage Company
WRENTHAM, MASS.



Production of Nozzles from 325-Stainless Forgings Nearly Tripled on Warner & Swasey "2ACs"

Further substantial cost savings are realized, too, because one operator easily tends the two Single Spindle Chucking Automatics — averaging as much production as six older hand turret lathes.

Machining tough materials is routine for this long-established Wrentham, Massachusetts, producer of quality safety and relief valves for the steam, petroleum, chemical and food industries.

For example, three pounds of metal are removed from these tough 325-Stainless Steel forgings during the first or roughing operation. Finish operations in the second chucking include a 14 and 16-pitch "V" form thread — tolerances of .002" — a 32 micro-inch finish — and two diameters, two faces and a bore that must be free of tool withdrawal marks. Output increased from 6½ to 17 pieces each 8-hour shift — a boost of 162%!

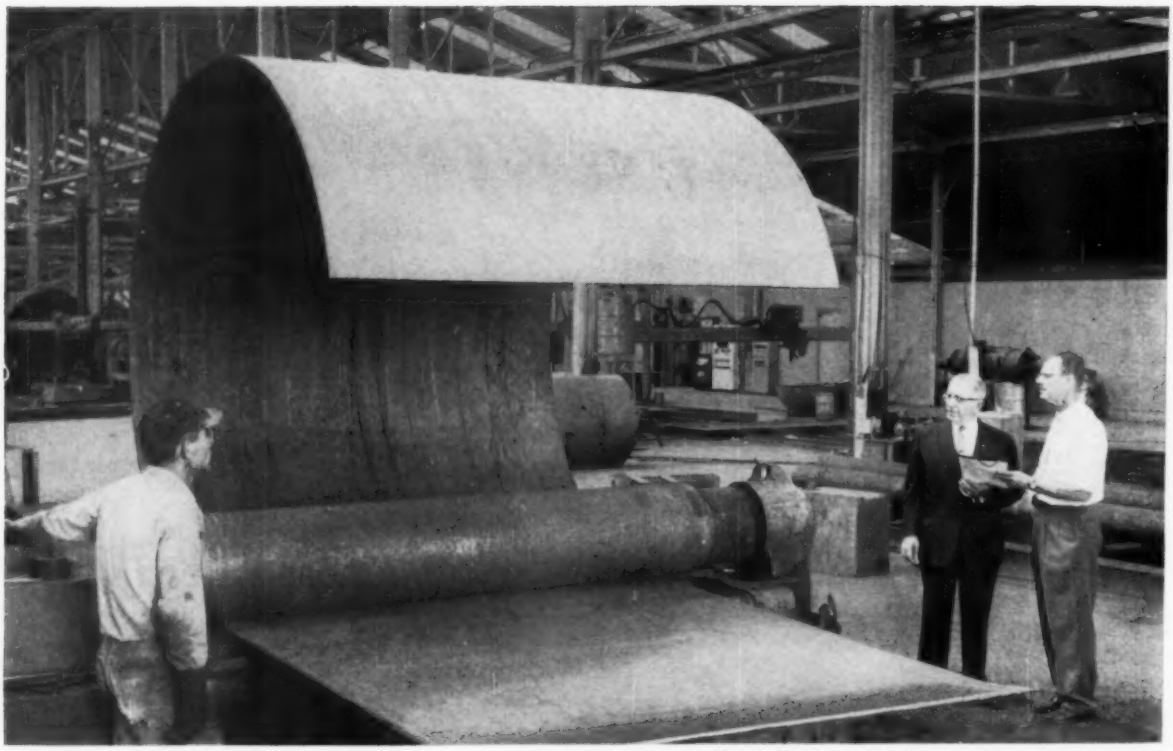
Compared to previously-used single spindle automatic chuckers, Crosby's new Warner & Swasey 2ACs are averaging up to 100% more production with 25% less time required to set up.

Crosby reports they especially like their 2ACs:

- **EASE OF TOOLING**—cross slide versatility, freedom from tooling interferences, ease of relieving turning, boring and facing cuts.
- **POSITIVE MECHANICAL THREAD LEAD CONTROL** for fine pitch threading accuracy in tough materials.
- **TWO-SPEED MOTOR** that gives greater choice of speeds, permitting efficient low speed threading as well as high speeds for finishing cuts.
- **RIGIDITY AND ACCURACY OF OVERHEAD TURRET DESIGN**—holding close tolerances and fine finishes no longer a problem.
- **CROSS SLIDE RIGIDITY AND SMOOTHNESS OF OPERATION**—cutter life on form cuts increased 2 to 1 over their other single spindle automatics.

WARNER & SWASEY
Cleveland
PRECISION MACHINERY SINCE 1880

You Can Produce it Better, Faster, for Less...
with a Warner & Swasey



Forming a cylinder of USS "T-1" Steel for a tank. First, the ends of the plate are crimped to the proper radius, then the entire plate is rolled in one continuous operation after which it is tack welded.

Stronger than ever

USS "T-1" Steel Plates now furnished to 100,000 psi minimum yield strength

11% greater yield strength. USS "T-1" Constructional Alloy Steel can now be furnished to a minimum yield strength of 100,000 psi in plates up to 2½ inches thick inclusive. The new minimum tensile strength—the point at which actual breakage occurs during test stretching—has been increased from 105,000 to 115,000 psi. The published tensile strength maximum of 135,000 psi remains unchanged. This is in addition to the regular (present types of) "T-1" Steel which is still available at a minimum yield strength of 90,000 psi.

Weight reductions up to 50% — or more. USS "T-1" Steel not only provides exceptional yield strength but also has good atmospheric corrosion resistance and high resistance to impact abrasion. And "T-1" Steel retains its toughness down to 50°F below zero. These factors make it possible to design extra-rugged, highly successful equipment for mining, earthmoving, and industrial uses. Weight savings from 25 to 50% are common, with a substantial boost in payload capacity.

Fabricating properties. The illustrations on this page show USS "T-1" Steel being formed and welded much the same as other steels. It can be forged, machined, flame-cut and generally fabricated without difficulty by following the instructions you will find in our technical booklet on USS "T-1" Steel. Write for a copy. United States Steel, Room 2801, 525 William Penn Place, Pittsburgh 30, Pennsylvania.

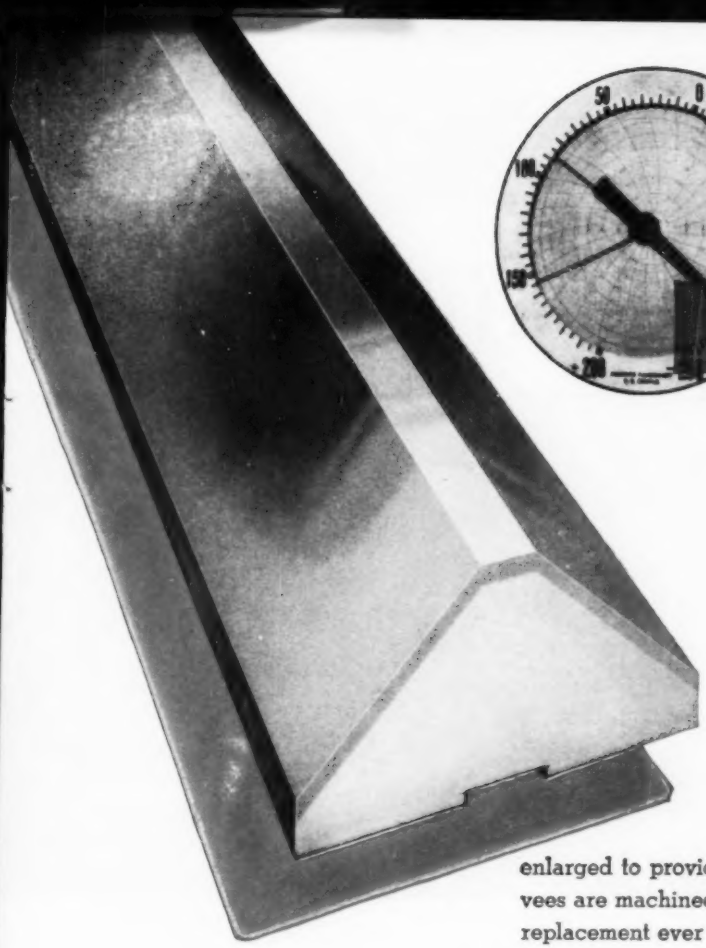
USS and "T-1" are registered trademarks

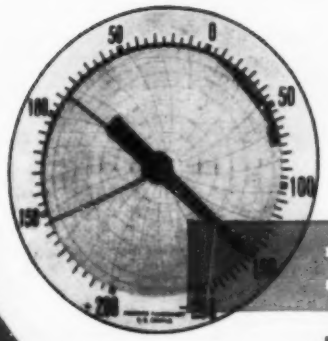
Welding sections together to form the tank. Temporary stringer beads are applied to support submerged arc welding. Later these beads are removed and replaced by further submerged arc welding.

United States Steel Corporation—Pittsburgh
Columbia-Geneva Steel—San Francisco
Tennessee Coal & Iron—Fairfield, Alabama
United States Steel Supply—Steel Service Centers
United States Steel Export Company

USS **United States Steel**

CIRCLE 223 READER SERVICE CARD ▶





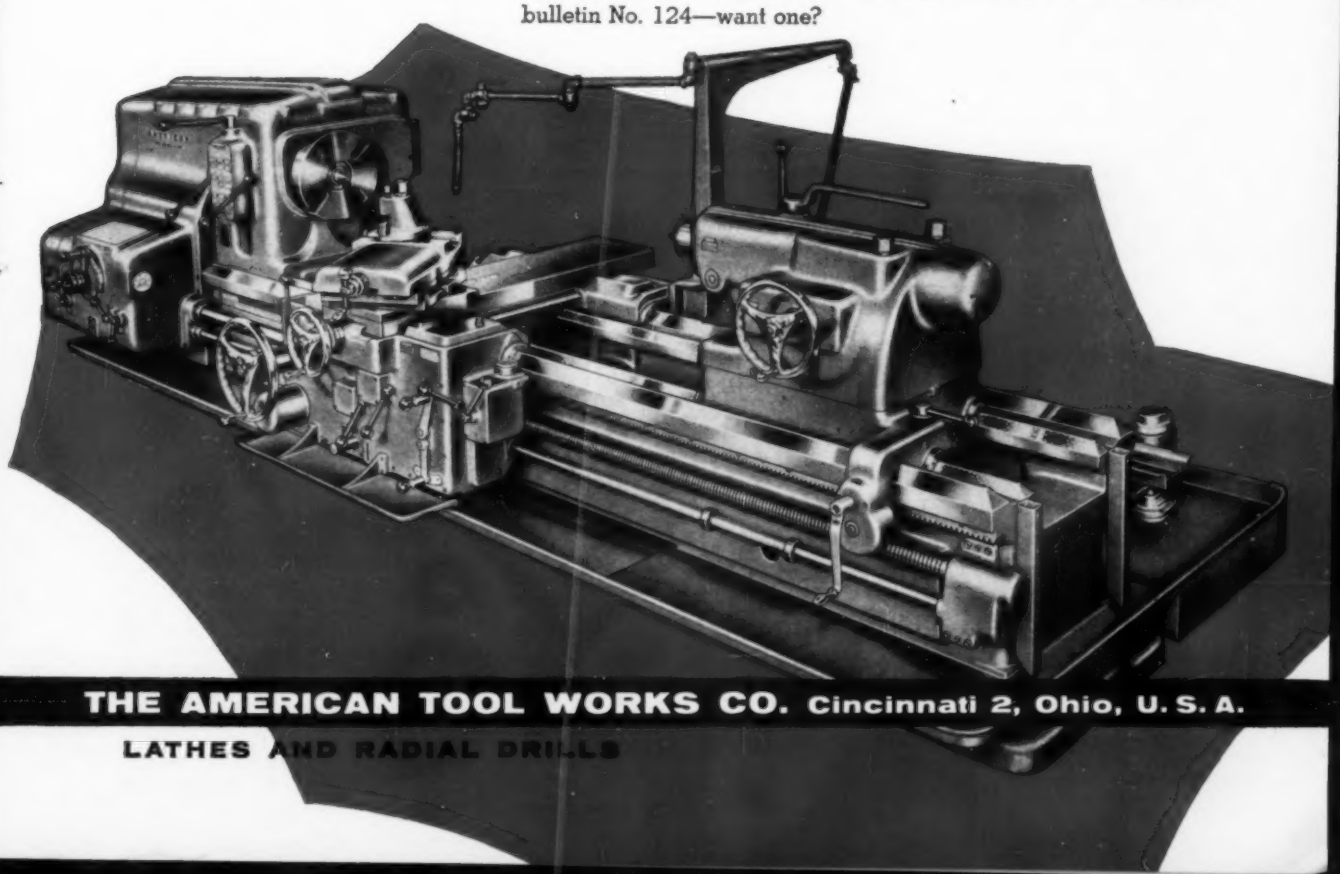
150° BELOW

After hardening to 62 Rockwell C the solid tool steel "AMERICAN" Pacemaker bed vees are stabilized in the deep freeze at 150 degrees below zero.

This freezing treatment not only raises the surface hardness but thoroughly stabilizes the metallurgical structure and prevents twisting or warping.

On the new DeLuxe Model "AMERICAN" Pacemaker the bed vees have been enlarged to provide extra large bearing area for the carriage. The vees are machined to gauge tolerances for interchangeability should replacement ever be required.

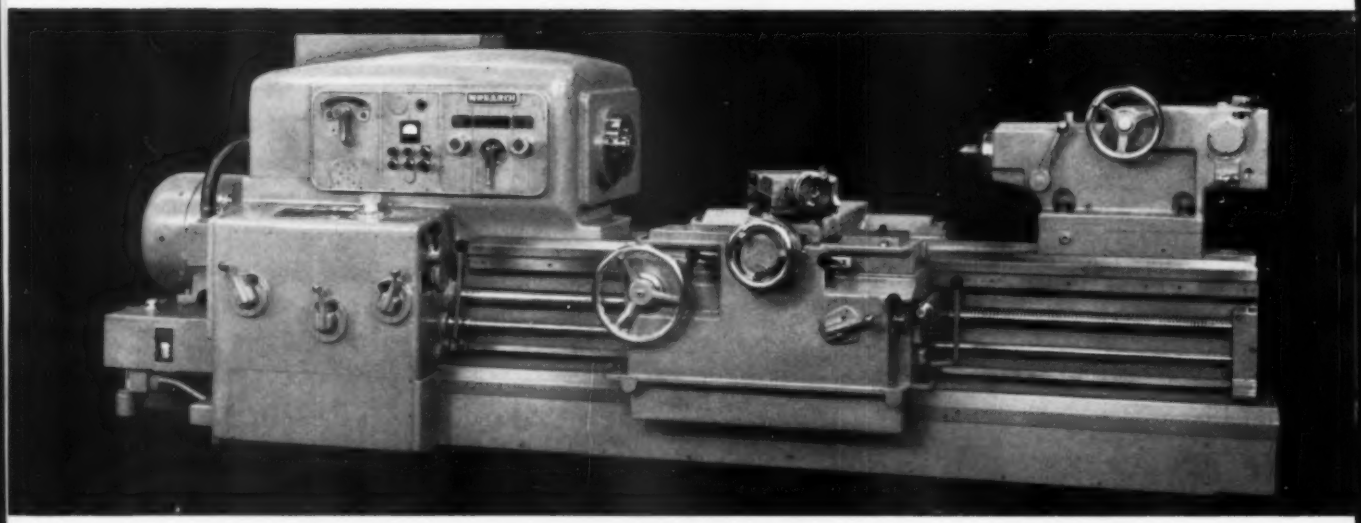
This is but one of the outstanding advantages offered by the new DeLuxe Model Pacemaker. Others are illustrated and described by bulletin No. 124—want one?



THE AMERICAN TOOL WORKS CO. Cincinnati 2, Ohio, U. S. A.

LATHES AND RADIAL DRILLS

BIG-BY 2 YARDSTICKS!



Heavy duty lathes are intended primarily for heavy stock removal from large work having considerable weight. But more than massive machine components and swing capacity are required. The basic consideration is almost always greater production, therefore lowered costs.

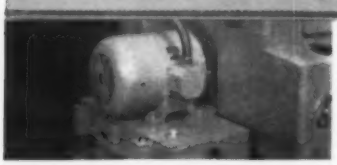
This you get in the Monarch Series 80 Heavy Duty Dyna-Shift—an ultra-modern machine which will remove more metal at any speed than is possible on any other heavy duty lathes. Maximum production results because the machine can be kept under full load during the entire cutting cycle. Major contributing factors are more machine output per unit of power input, less operator effort, reduced maintenance and ease of supervision.

Performance reports from the field reveal production increases of 25% or more along with a like improvement in tool life As always, invest in the best—the cheapest in the long run. The Series 80 includes two separate machines—two models for work requiring 25″-30″ clearance diameter, 16″-20″ swing over cross slide and three models for larger and heavier work in the range of 32″-40″ clearance diameter and 20″-28″ swing over cross slide.

These machines are big in size and even bigger in productivity—Ask for Booklet 1603.

THE MONARCH MACHINE TOOL COMPANY, SIDNEY, OHIO

PRODUCTIVITY



ELECTRICALS RIGHT WHERE THEY BELONG

1. External main drive motor mounting and external electrical control mounting (either NEMA or JIC) for quick accessibility.
2. Motor mounted on hydraulic system sump also supplies power for hydraulic pump.

PROTECTED GEAR BOX AND END GEARING

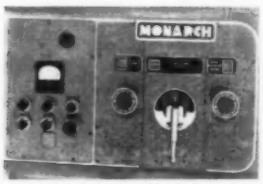
1. Both the gear box and end gearing are totally enclosed. Lubrication is kept in, dirt kept out, original accuracy maintained.

SPECIAL INTERLOCKS—SAFETY FIRST

1. When machine is started, the brake engages automatically, preventing spindle rotation regardless of main control lever position.
2. No speed shift can be made with spindle rotating. More than anything else this preserves the original accuracy of headstock gearing.
3. Leadscrew and feed rod cannot be engaged simultaneously; neither can feed and power rapid traverse.

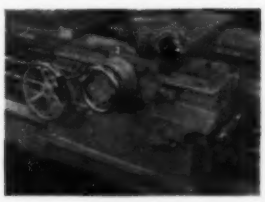
CIRCLE 224 READER SERVICE CARD

THE HEADSTOCK THAT THINKS



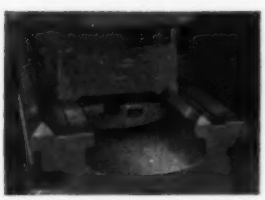
1. 36 speeds—range 10 to 1250 R.P.M. on some models, 8 to 1000 R.P.M. on other models—ratio 1 to 125. Standard range low enough, high enough, with plenty of speeds in between to provide reasonably constant surface cutting speed on most work.
2. Operator works in terms of surface cutting speed. Machine automatically figures correct R.P.M. and sets up shift. Operator sets two dials—one for work diameter, the other for desired surface speed. A speed indicator always shows the R.P.M. in engagement.
3. Flip of a lever gives free spindle in a jiffy. And there is a generous 3-1/16″ or 3-9/16″ hole through the spindle.
4. Hydraulic brake and clutch are self-adjusting for wear. Being under automatic machine control regardless of load, operator needs not supply power for engagement.

APRON—THE CONTROL CENTER OPERATORS GO FOR



1. Provided with four-way, hydraulic, variable speed power rapid traverse. Both carriage and cross slide traverse may be engaged simultaneously. Infinitely variable speed feature permits such extremely close control that manual handwheel traverse is virtually eliminated.
2. Apron and cross feed handwheels automatically disengage during traverse as a safety feature. A single jaw clutch in each mechanism causes feed pick-up at the same point after any traverse movement.
3. Positive, cam controlled feed frictions. Application is such that machine never loses its chip under the heaviest of cuts.
4. All controls located to permit operation from a stand-up position—no stooping or stretching necessary.

THE BED—SOLID AS GIBRALTER

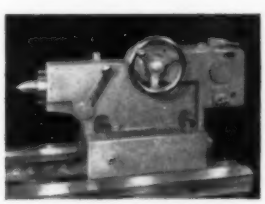


1. All four bed ways flame hardened and precision ground to keep them factory-fresh for years to come.
2. Triangular bridge type girth construction provides stability needed for heavy duty work. Center section of bed designed in such a manner that chips automatically flow through openings in the rear to chip pan for extra-easy removal.
3. With chip pan set to rear and low work center height, operator can get conveniently near the spindle to change centers, chucks, work pieces and so forth.
4. Longer machines equipped with traveling rod supports which are automatically picked up and dropped off by apron.

EXTRA EQUIPMENT—EXTRA PRODUCTION

1. Additional equipment in considerable variety is available for the Series 80 line. Consider, by all means, the advantages of the "Air-Gage Tracer", a means by which thousands of users have reduced costs substantially.
2. Ask for descriptive Booklet 1603 which not only describes the basic machine but the commonly used items of additional equipment and includes full specifications.

THIS TAILSTOCK MEANS BUSINESS



1. Either single speed or two speed range type available with dead or anti-friction center spindle. Sufficient mass, rigidity and spindle size (5-3/4″ or 6-1/2″ diameter) to support the heaviest of cuts.
2. Work piece expansion, due to heat, absorbed by heavy duty springs in tailstock.
3. Handwheel located at front for operator convenience when changing work pieces.
4. Movement along bed manually or by power. This combination satisfies all turning conditions.

COMPLETE AUTOMATIC LUBRICATION

1. Headstock, end gearing and gear box served by single system of the filtered, combination mist-splash type.
2. Apron lubrication system of the circuited, metered and filtered type also provides oil to carriage guide ways and cross slide bearings. There is ample lubrication during both power and manual longitudinal and cross feed.
3. Tailstock has its own lubrication system.

MACHINE CONTROL—THE EASY WAY

1. Series 80 controlled by a three-position lever at the apron. A duplicate lever close to the headstock is provided for setup purposes. With this lever, work rotation may be started or stopped and jogging may be accomplished.
2. Shifting, an operation performed many times each day, is at fingertouch ease and speed. Hydraulic power does the work of clutching, braking, gear shifting and jogging.

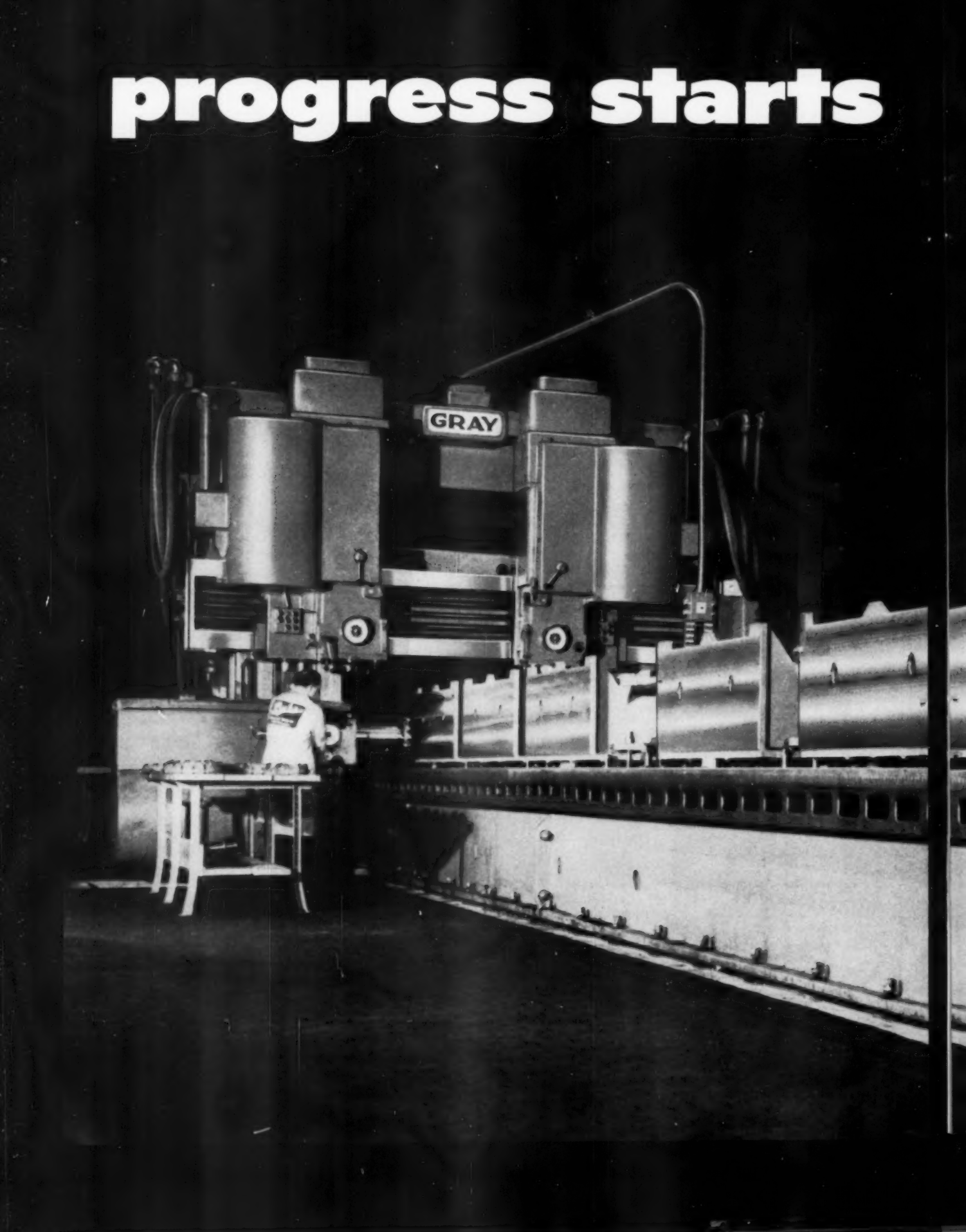
SUPERVISION IN A JIFFY

1. At a quick glance, supervisor may check (a) work diameter setting, (b) S.F.P.M. setting and (c) H.P. consumption. This makes it possible easily and quickly for him to assure full productiveness of the machine and the operator at all times.

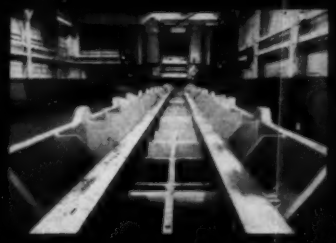
Monarch
TURNING MACHINES
ACCURACY • ECONOMY • LONG LIFE
FOR A GOOD TURN FASTER . . . TURN TO MONARCH

CIRCLE 225 READER SERVICE CARD

progress starts



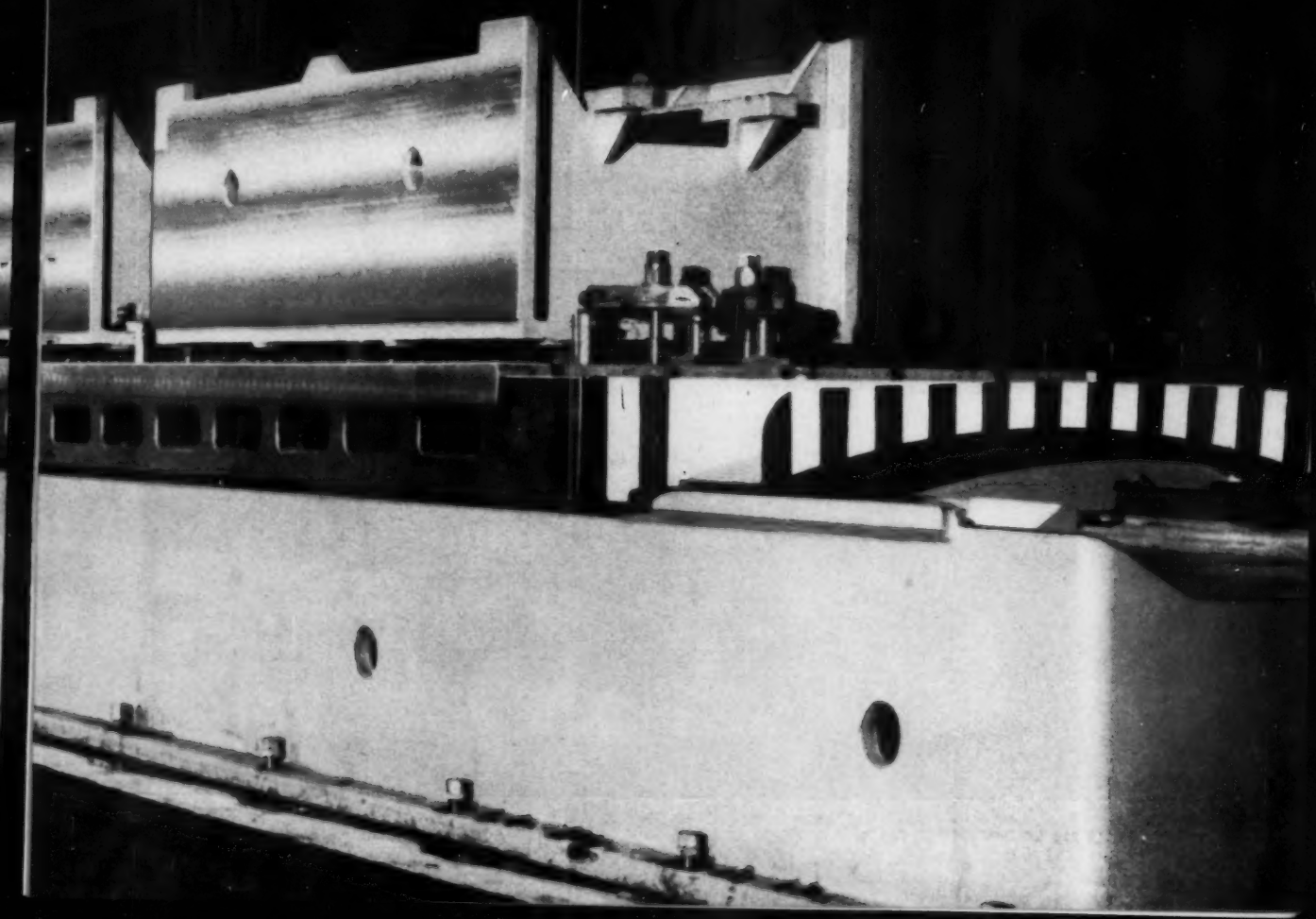
on a GRAY



What you see being milled on this big 105 foot long Gray, are transfer machine bases of the future... six at a time... automation production machines of Buhr Machine Tool Co., of Ann Arbor, Michigan. It's logical that this company, engaged in producing cost cutting, time saving equipment, should select a cost cutting, time saving Gray to do the job.

Gray unit head planer type millers dominate the field of modern heavy duty milling. This 66" x 66" x 50' giant can simultaneously deliver 300 H. P. to its four cutters. Duplex tables virtually eliminate idle time by permitting work set-up on one section, while work is being milled on the other section. Unusually simple control encourages maximum operator efficiency. All this, plus mirror smooth surfaces milled to precise tolerances maintain the Gray reputation for top quality the world over.

The G. A. GRAY Co., Cincinnati 7, Ohio



NOW

Motch & Merryweather offers new milling and centering machines to handle any production requirement

TRUNNION-TYPE MILL & CENTER

Model MCT-3 for largest runs in high-production plants. Features:

- Capacity of 1 to 6-inches diameter and 48-inch length
- 3-station trunnion-type design with self-equalizing vises at each station
- Building-block design incorporating Motch & Merryweather standard Milling and Drilling units
- Right-hand head and trunnion adjustable for various lengths
- Complete automatic cycle, hydraulically operated

BUILDERS OF AUTOMATIC PRECISION CUT-OFF, MILLING, DRILLING AND SPECIAL MACHINERY

With the addition of newly designed Milling and Centering Machines, Motch & Merryweather now provides equipment that features ruggedness and versatility to economically handle industry's production requirements—from short runs of small lots to the largest runs being handled in today's high-production plants.

Call in your nearest Motch & Merryweather representative and get the complete story of how these versatile machines can add flexibility and dependability to your *own* machining operations. Or write direct to our Home Office, 1250 East 222nd Street, Cleveland 17, Ohio.

INLINE MILL AND CENTER

Model MC 1648 for average production shops. Features:

- Available in two sizes: 3½-inch diameter and 24-inch length; 6-inch diameter and 48-inch length
- Building-block design incorporating Motch & Merryweather standard Milling and Drilling units
- Hydraulically operated self-centering vises
- Heads are mounted on hardened and ground ways
- Complete automatic cycle, hydraulically operated

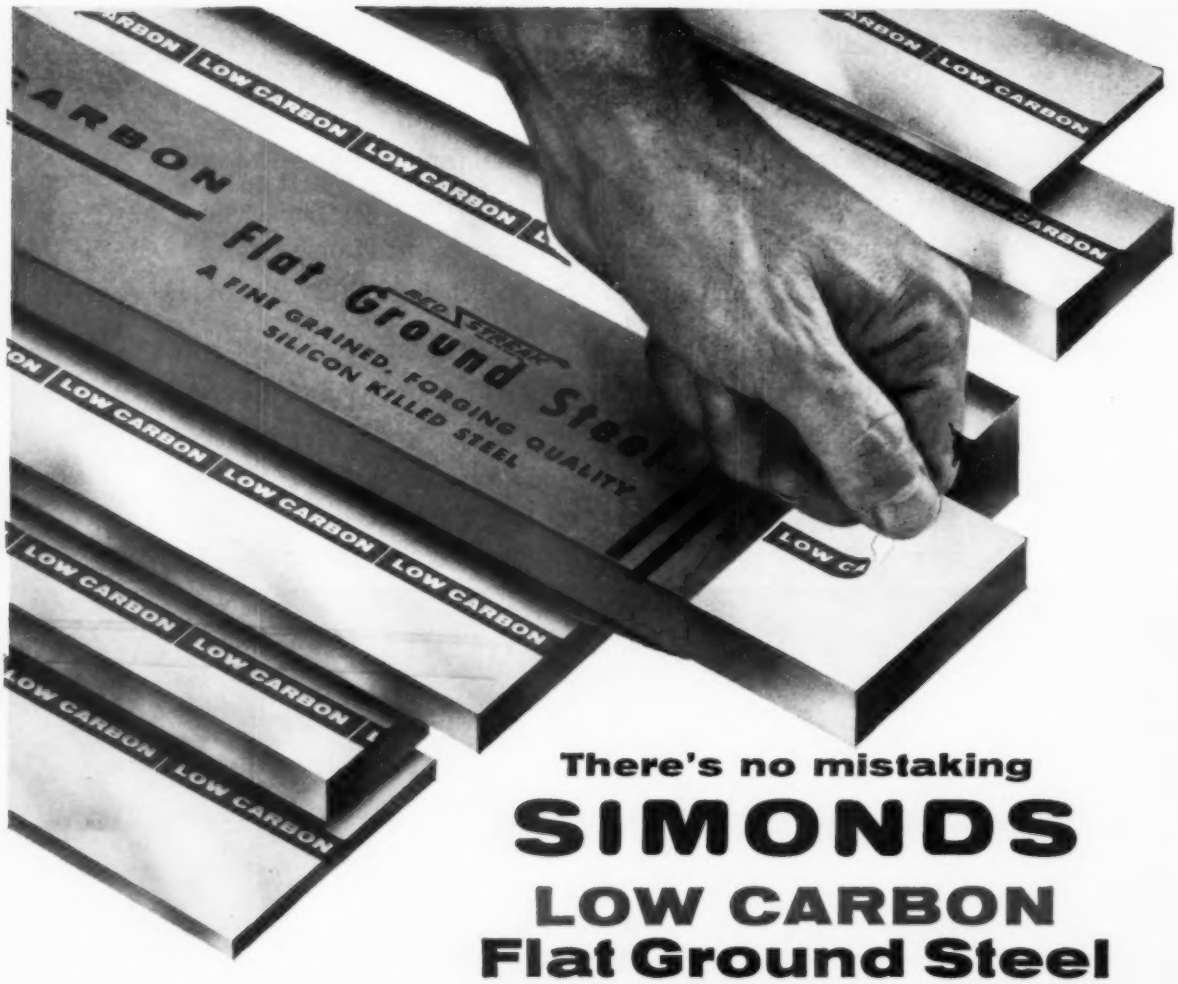
SINGLE END MILL AND CENTER

Model SMC for short run—small lot production shops. Features:

- Handles stock from ¾ to 3½-inch diameter and 4½ to 48 inches in length
- Positive length is easily maintained by pre-set adjustable stock stop for first operation and adjustable center for gaging second operation
- Manual clamping and feed of center drilling unit

MOTCH AND MERRYWEATHER

Machine Tool Manufacturing Division
Cutting Tool Manufacturing Division
CLEVELAND
Avey Division, Cincinnati



There's no mistaking

SIMONDS

LOW CARBON Flat Ground Steel

LOW CARBON LOW CARBON LOW CARBON LOW

← with this NEW Full-Length Labeling →

There's no confusion with other types of steel, when you use Simonds Low Carbon Flat Ground Steel. For this new product is readily identified by the full-length, peel-off tape. What's more, this modern labeling does not mar the bar . . . does not interfere with scribing . . . leaves no trace when removed.

This new low-cost steel completes the Simonds line . . . OIL and AIR Hardening Die Steels, and now LOW CARBON Flat Ground Steel as well. All three types are made to the same close tolerances, with the same extra smooth surface finish and good machinability.

Simonds Low Carbon Steel comes in flats from 1/16" to 1½" thick, and ½" to 16" wide; also in squares from ⅜" to 2⅞". All stock sizes come in standard, ready-to-use 24" lengths, individually packaged. Special sizes on order. Call your Simonds Distributor *now*.

For Fast Service from Complete Stocks Call your

SIMONDS Industrial Supply DISTRIBUTOR

SIMONDS SAW AND STEEL CO.

FITCHBURG, MASS.

Factory Branches in Boston, Chicago, Shreveport, La., San Francisco and Portland, Oregon
Canadian Factory in Montreal, Que., Simonds Divisions: Simonds Steel Mill, Lockport, N. Y.
Heller Tool Co., Newcomerstown, Ohio, Simonds Abrasive Co., Phila., Pa., and Arvida, Que., Canada

A New Lucas Lathe
Fully-automatic Tape Control, Tracer Control or both. Infinitely variable speeds and feeds. Automatically-maintained, constant-cutting speeds on changing diameters. Console control from moving operator's platform. *Three* hardened and ground ways. Self-contained Motor Generator Set.
The Lucas Lathe — perfect for your large, lightweight, close tolerance, intricately-shaped problem jobs. Lucas Machine Division, The New Britain Machine Company, 12302 Kirby Avenue, Cleveland 8, Ohio.
LUCAS
OF
CLEVELAND

Lucas Tape and Tracer Control

Lucas Tape and Tracer-Controlled Machines offer the advantage of maximum flexibility of operation to suit changing job requirements. All models can perform:

- pendant-controlled boring, drilling and milling
- Numerical Positioning Control, automatic cycle boring, drilling and milling
- pendant-operated contour tracing
- tape-controlled, automatic cycle contouring

These features include punched tape or magnetic tape controlling: head, table, saddle, horizontal rotary table, vertical rotary table and spindle speeds. For tool room work — for precision production, only Lucas Tape and Tracer Control offers so much flexibility in one machine. Lucas Machine Division, The New Britain Machine Company, 12302 Kirby Avenue, Cleveland 8, Ohio.

Better machining starts with Alcoa Screw Machine Stock

Here's fast, precise deep drilling with ALCOA ALUMINUM 2011-T8

Wall thickness only .024 in. —calls for accuracy

This fitting has a deep-drilled .125 in. dia. hole—approximately 7 diameters of the drill in depth. Now look at the drawing. Notice the concentricity tolerance on the hole with a wall thickness of only .024 in. (difference between base of V-groove and hole diameter)—no place for a drill to wander.

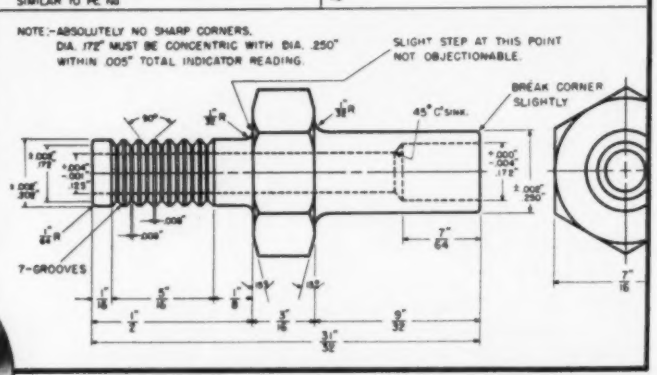
If you're handed a job like this, ask for ALCOA® Aluminum 2011-T8 (artificially aged 2011-T3), best for deep drilling where the ratio of length to diameter of the hole is 5:1 or more. With 2011-T8, you'll get accurate concentricity while maintaining fast feeds and speeds (see layout).

Speed and accuracy are only part of the story. ALCOA Aluminum retains the surface finishes produced by machining—cut-off finish is superior. You can polish, buff, brush or burnish aluminum—and parts don't deteriorate in storage. Aluminum's light weight means easier handling, faster stock-up time.

For more about better machining with ALCOA Screw Machine Stock—

- Meet Tom Conroy, ALCOA's field consultant. He'll be glad to demonstrate aluminum's advantages. See coupon.
- Ask for immediate stock delivery by calling your nearest ALCOA sales office or distributor.

REFER TO CUSTOMER'S	PRINT NO. PG000 FU345	PC. NO. V-15-1129-1
SAME AS Pc. No.	FITTING PART TO	
SIMILAR TO Pc. No.		


NOTE:-ABSOLUTELY NO SHARP CORNERS.
DIA. .172" MUST BE CONCENTRIC WITH DIA. .250" WITHIN .005" TOTAL INDICATOR READING.
SLIGHT STEP AT THIS POINT NOT OBJECTIONABLE.
BREAK CORNER SLIGHTLY
45° C'SINK.
7-GROOVES

MULTIPLE SPINDLE LAYOUT

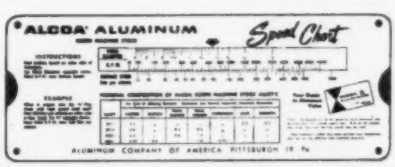
Date 11/6/54	Pc. No. V15-1129-1	Order No.
Mach. ½" Dav.	Mach. No. Mod. B	Material Grade 2011-T8
Chucks 7/16 Hex.	Fingers 7/16 Hex.	Material Size 7/16 Hex.
Spindle RPM 3000	Gears 42-21	
Kind of Threading Spindle	Ratio On Off	
Threading Rev.	Total Useable Rev./Pc. 108	
Surface Speed 397 Ft. Per Min.	Min. Index Time 9/10 Sec.	
Time Per Pc. 2.8 Sec.	Feed Gears, Idler 50-60-80	

SEQUENCE OF OPERATIONS

Operation	Cut	Rise	Lev.	HOND	Feed	Cam No.	Tool	Holders	Special
1—Box .250" Dia.		.296	.79		.0027	1/8	15-1131-1	#20 Box Tool	
Center							Pick-up in Above Tool		
2—R. Form		.171	.92		.0016	1/16	15-1129-1	Cir.	(Carboloy)
Drill .172" Dia.		.375	1.		.0034	1/8	11/64" Dia. Twist	#20 Floating	
Support							15-1129-1 in Above Holder		
3—Form (Grooves)		.062	1.		.0006	1/16	15-1131-1	Cir.	
Drill ⅛" Dia.		.750	1.		.0069	Spec. Pull-out	#30 Twist	#20 Floating	
Support							15-1129-1 in Above Holder		
4—Drill ⅛" Dia.		.187	1.		.0017	1/16	#30 Twist	#20 Floating	
5—Cut-off		.341	.91		.0031	1/8	15-1131-1	Cir.	

FREE!

Send for Alcoa's *Speed Chart*, a handy slip-stick calculator for every screw machine operator—and *Alcoa Aluminum in Automatic Screw Machines*, valuable procedures manual written for production men.



Look for this label . . . it's your guide to the best in aluminum value

ALCOA ALUMINUM
ALUMINUM COMPANY OF AMERICA

ALCOA THEATRE
Fine Entertainment
ALTERNATE MONDAY EVENINGS

Aluminum Company of America
868-L Alcoa Building, Pittsburgh 19, Pa.

Yes, I'd like to—

- ☐ **hear from Tom Conroy**
- ☐ **have a copy of your book and a *Speed Chart***

Name_____

Position_____

Company_____

Address_____

City_____ **Zone**____ **State**_____

AT A FAMOUS ORDNANCE PLANT IN NORTHERN LOUISIANA:

600-Ton Lubrication Job for Cities Service!

The huge 600-ton press above is one of several at a well known Louisiana ordnance plant operated by the Remington Rand Division of Sperry Rand Corporation.

A big machine, it naturally poses a big lubrication job... but not so big that Cities Service Pacemaker Oil can't take it in stride. With unusually high viscosity index and superior fortification against oxidation, corrosion and rust, Pacemaker is a natural for the task.

Likewise, throughout the various stages of producing artillery shells—the end product—Cities Service lubricants are hard at work.

Clearly, there's little room for error here—either in the product itself or in the machines that make it. That's why Cities Service lubricants were chosen ... and it's an equally good reason for making them *your* choice.

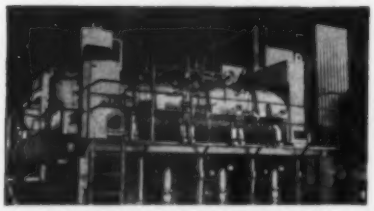
For a survey of your plant's lubrication needs, talk with a Cities Service Lubrication Engineer. Or write: Cities Service Oil Company, Sixty Wall Tower, New York 5, N. Y.

HOW THE ORDNANCE PLANT USES CITIES SERVICE LUBRICANTS

MACHINE	LUBRICANT
Large presses	Pacemaker 3 Hydraulic Oil
Airlines	Pacemaker 1
Speed reduction units	Pacemaker 6
Worm gear reduction units	Optimus 6
Package compressor units	Pacemaker 5
Metal working machines requiring a water soluble cutting oil	Chillo A
General Lubrication	Trojan Gear Oils, Trojan H-2 Grease

CITIES SERVICE

QUALITY PETROLEUM PRODUCTS



High Speed Gas Furnace heats steel to 2660 degrees F. All lubrication is supplied by Cities Service products.

Partially Finished Shells await final forming. Unusual number of forming operations are required to produce final product.

Forming Press does final forming of artillery shells. The press is lubricated by Cities Service Pacemaker Hydraulic Oil.

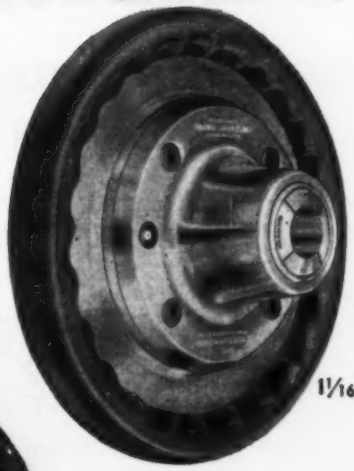
HARDINGE
ELMIRA, N.Y.

HARDINGE Sjogren Chucks

Quality at Low Cost

HARDINGE-SJOGREN Speed Collet Chucks for tool room lathes, engine lathes and grinders.

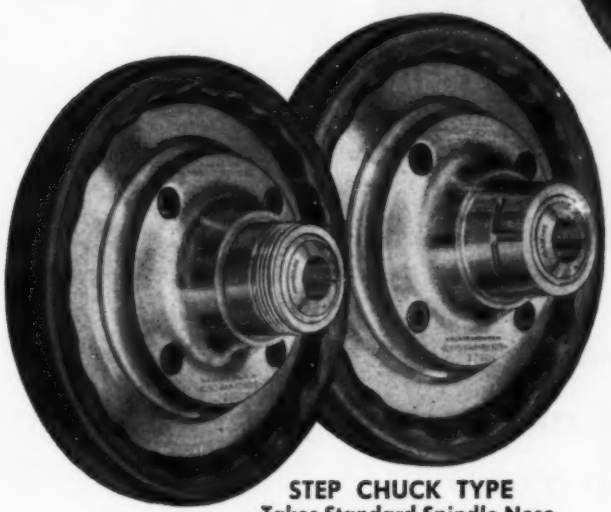
Available for Threaded Nose, Cam Lock, Taper Key Drive and American Standard Spindles.



REGULAR TYPE

AVAILABLE IN FIVE COLLET CAPACITY SIZES

1 1/16", 1 3/8", 1 3/4", 2 1/4", 3 1/2"



STEP CHUCK TYPE
Takes Standard Spindle Nose Accessories As Used With Hardinge Precision Machines

LEVER TYPE

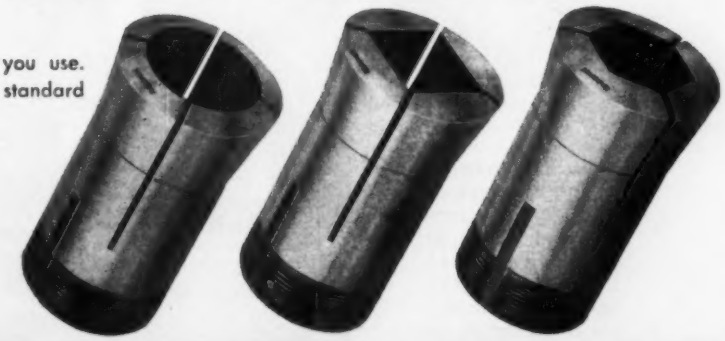
Ask Your Hardinge Representative or Local Distributor For Bulletin 88

HARDINGE
ELMIRA, N.Y.

HARDINGE Low Cost Steel Collets

Maximum efficiency — Pay for only what you use. Records show that 82% of all sizes used are standard 16th sizes.

Buy only the sizes you use — Hardinge Collet stocks are available in Atlanta, Boston, Hartford, New York, Philadelphia, Rochester, Dayton, Detroit, Chicago, St. Louis, Minneapolis and Los Angeles. Also, Toronto and Montreal, Canada.

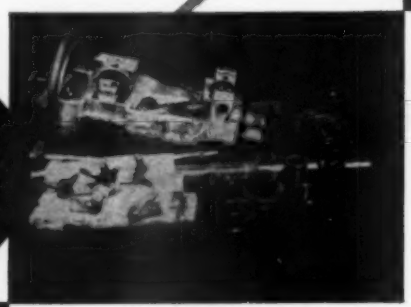


HARDINGE BROTHERS, INC., ELMIRA, N. Y. U.S.A.

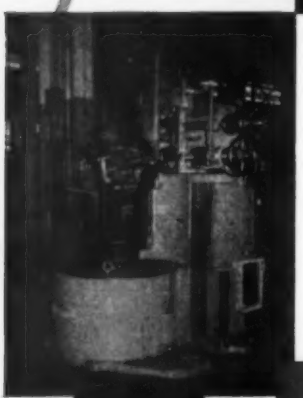
BULLARD

rebuilds from the ground up

Yes — we disassemble each machine right down to the bed.



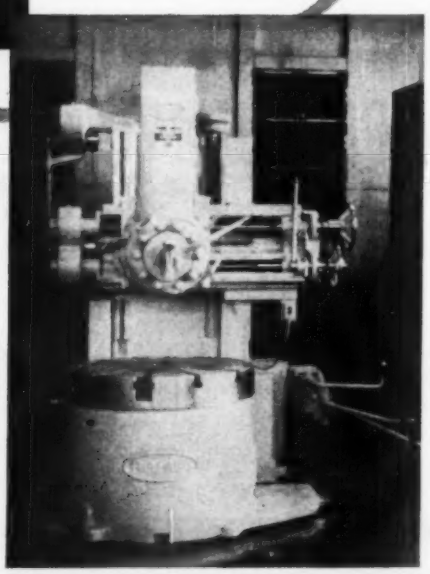
Each individual piece is cleaned and inspected



and if found serviceable is re-used, if not, it is replaced.

What does this mean to You?

1. Thorough workmanship by the same skilled craftsmen that built the machine.
2. Only "original equipment" precision replacement parts, where necessary.
3. Fast service.
4. One year guarantee on all parts replaced — including labor.

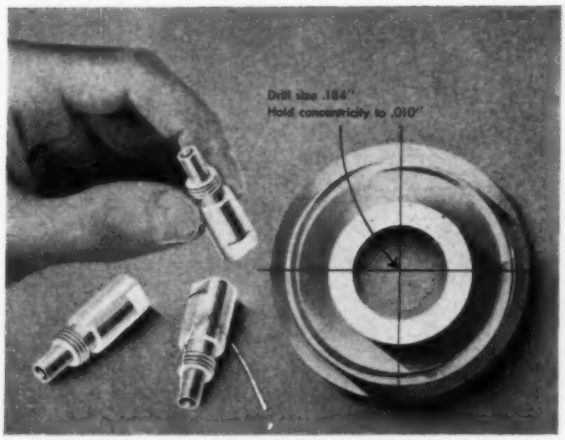


If you're planning to rebuild any of your Bullard machines contact your nearest Bullard Sales Office or Distributor for a quotation or write

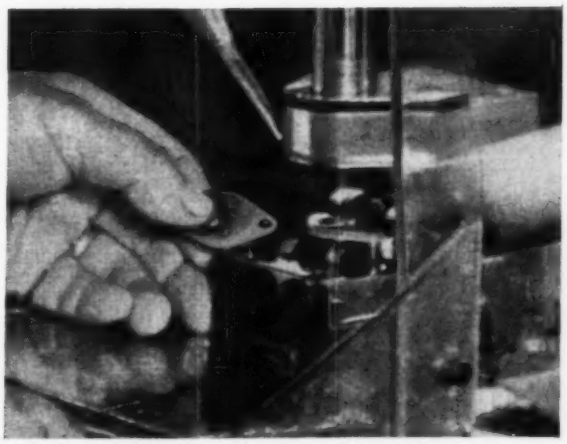
BULLARD

THE BULLARD COMPANY BRIDGEPORT 9, CONNECTICUT

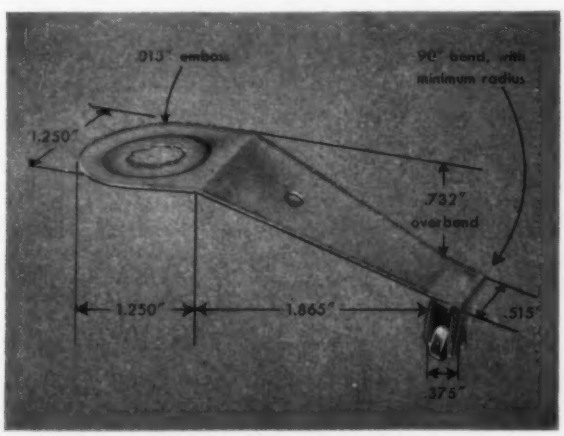
THE RIGHT METAL often costs less, may give you surprising savings in fabricating time and cost. Talk to the Man from Anaconda about matching metals to your specific needs, today.



BRASS ROD WITH A SLIGHTLY HARDER CORE than standard rod eliminated rejects (that had run up to 15%) for M. J. Grass Screw Machine Products Co., Buffalo. With standard rod, in drilling a deep hole on multiple spindle machines, the drill tended to wander past the concentricity tolerance.

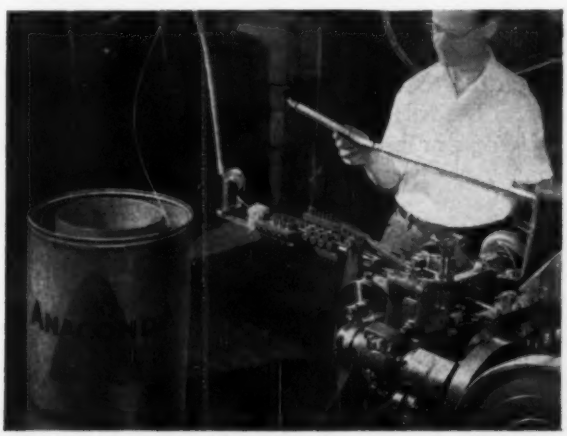


LEADED COPPER STRIP (machinability rating 80%; conductivity, 99% IACS) boosted production, cut over-all costs 25% for Trueblove & Maclean, Waterbury, Conn., in making power transistor bases. Adequate production with ordinary electrolytic copper would have called for new equipment investment.



SUPERFINE-GRAIN PHOSPHOR BRONZE eliminated fractures in forming complex variable voltage tap springs (above) used in Lionel's Trainmaster transformers. Lionel had considered substituting a costlier alloy but Duraflex* did the job at no extra cost.

*Anaconda superfine-grain phosphor bronze.



PAY-OFF BARRELS with big coils of brass wire cut down-time 90% at wire forming machines for West Haven (Conn.) Buckle Co. Machines making surgical buckles had used light coils for free pay-off; new coils had to be fed in about every hour.

FROM a base of 93 standard alloys, The American Brass Company can provide an almost unlimited number of combinations of useful properties. It may take only a minor variation in fabrication or annealing in your present alloy to make the metal fit your need exactly. Or you may need another alloy—perhaps one that is less familiar to you because it has had such highly specialized application. So when new or unusual problems arise, ask for the help of our Technical Department. See your Anaconda representative or write: The American Brass Company, Waterbury 20, Conn. In Canada: Anaconda American Brass Ltd., New Toronto, Ontario.

5806

ANACONDA®

COPPER • BRASS • BRONZE • NICKEL SILVER • MILL PRODUCTS

Made by The American Brass Company

John Dewhurst tells how the Moore Jig Borer pays off in production of instrument components

This is another in a series featuring the views of owners of leading tool and die companies

by **JOHN D. DEWHURST**
President
Arrow Tool Company, Inc.
Wethersfield, Conn.
Prototype and Production
of Instrument Components

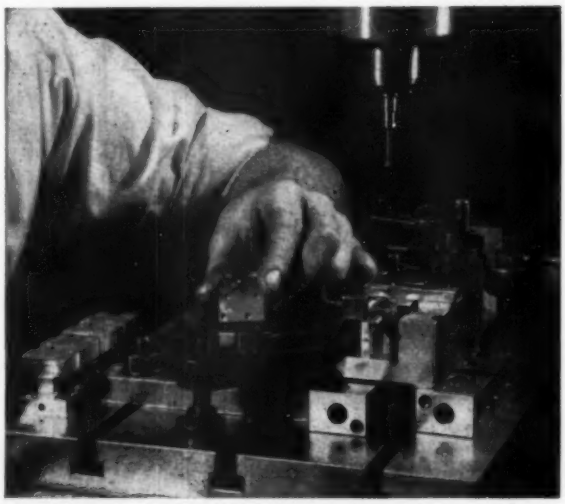
"Consistent accuracy is the keystone of our ability to satisfy our customers. They demand production quantities of instrument components and assemblies varying in size, materials, and form...*finished to the same precise tolerances as their prototypes.* It's been our experience that Moore Jig Borers can be depended upon to do such jobs, and most economically, too.

"Since we need fine precision for both tooling and production, our Moore Jig Borers are invaluable. First, we use the Moore Jig Borer to hold tolerances on our tools and gages. Then, we use the *same* machine for a production run of 50 to 70 hours a week. Over a period of several years, our Moore Jig Borers have averaged 3100 production hours per year, holding tolerances to 'tenths,' and providing an unbeatable record of trouble-free performance."

If high-precision quality production is your goal, learn how flexible Moore equipment can help you achieve it. Booklets describing the unique features of Moore Jig Borers and Jig Grinders can be obtained by writing...

MOORE SPECIAL TOOL COMPANY, INC.
736 Union Avenue, Bridgeport 7, Connecticut

HOLES, CONTOURS AND SURFACES, Moore's authoritative book, tells how to produce tools, dies and precision parts *the modern way*. 424 pages, 495 illustrations. $5 in U.S.A., $6 elsewhere.



ON SMALL COMPONENTS such as this brass block, Moore Jig Borers quickly bore close-tolerance holes. This workpiece will be part of an electronic data processing machine.

MEDIUM SIZE CASTINGS are precision-bored on this Moore Jig Borer. At Arrow Tool, Moore Jig Borers average 3100 hours per year in high-precision production operation; serve "double-duty" in holding tooling tolerances.

MOORE TOOLS

FOR TOOLING...AND PRODUCTION

JIG BORERS • JIG GRINDERS • PANTOGRAPH WHEEL DRESSERS • PRECISION ROTARY TABLES • HOLE LOCATION ACCESSORIES

CIRCLE 238 READER SERVICE CARD

CIRCLE 239 READER SERVICE CARD ►

THEY *get to take a last look inside*

Standard Oil research develops method for inspecting lubrication of enclosed parts without disassembling

What if you had to make a final inspection of enclosed parts to be sure they were lubricated and you could not do it without disassembling? Standard Oil research scientists have just developed an instrument system that determines lubricant level in an instant. The device measures the density of an assembly so precisely the presence or absence of the desired quantity of lubricant registers on a meter.

Having such a unit might permit you to shorten an assembly line or reorganize assembly operations for greater convenience, speed, economy. The research men at Standard who developed this inspection method will be glad to share their know-how with you to help you fit it to your assembly operations.

This is the research pay-out you get from Standard. This is the "something more" Standard gives to industry besides the research which has established Standard Oil petroleum products as the industry criteria for quality.

For more information about this development or for assistance on other lubrication problems, inquire of any of the 48 Standard Oil district offices in the 15 Midwest and Rocky Mountain states. Or write **Standard Oil Company (Indiana), 910 South Michigan Avenue, Chicago 80, Illinois.**

You expect more from **STANDARD** *and get it!*

Best way to find out what these really do is try 'em

It's the old story of the pudding and the proof. You don't know how good these new Nicholson Hand and Power Hacksaw Blades, and Band Saw Blades and Black Diamond Hand Hacksaw Blades are till you've given them a try. Same goes for Nicholson *Precision* Ground Flat Stock.

Selected Industrial Distributors all over the country have these fine new products now. And while they're new products, they're made in the quality tradition of Nicholson and Black Diamond files.

There's a blade for your metal cutting jobs. Most likely you'll find that we offer advantages you haven't been getting in the blades you're accustomed to. As for the Flat Stock—well, you name it and your Nicholson Flat Stock distributor will see that you get it—even out-of-the-ordinary specifications.

We invite you to give these latest additions to our line a try. We're pretty sure you'll like them. And we'd be delighted to hear your reactions . . . more than pleased to hear from you personally.

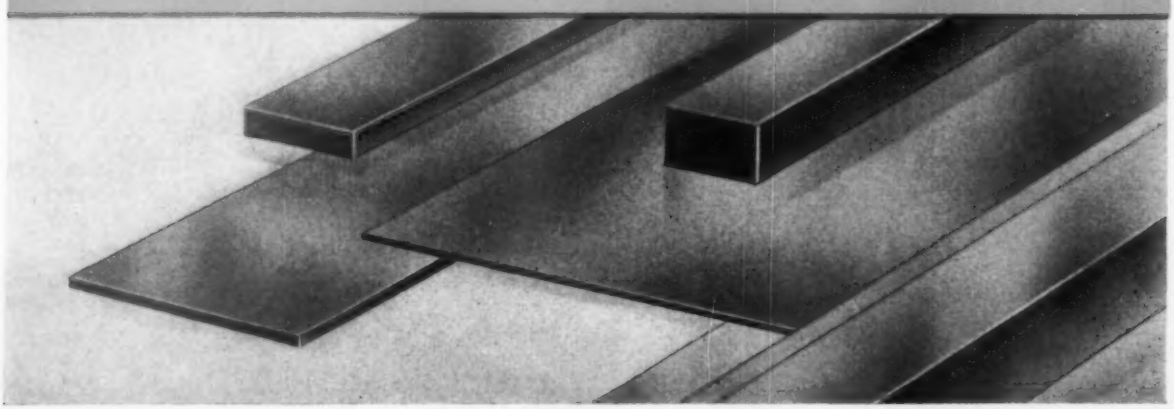
All Nicholson and Black Diamond products are sold through Wholesale Distributors—industry's own nation-wide supply network.

NICHOLSON U.S.A.

NICHOLSON FILE COMPANY

PROVIDENCE, R. I.

BLACK DIAMOND U.S.A.



DIRECT

At end of cut, operator spins speed selector handwheel to new setting. Hydraulic power shifts gears while operator indexes turrets and repositions tools for next cut. There is no waiting, no stopping of spindle, no releasing of clutch.

PRE-SET

While machining is being performed, operator sets speed selector on desired speed for next cut. When ready to change, he simply taps Hi-Lo lever to initiate shift, and is free to index and ready tools for next cut.

HI-LO

During either direct or pre-set operation, operator can reduce speed instantly in 8:1 ratio on Ram Type and 6:1 ratio on Saddle Type Turret Lathes by depressing Hi-Lo lever. Ideal when going from drilling, turning or boring to threading, forming or reaming. Raising Hi-Lo lever returns spindle to original speed.

No computing. Operator rotates knurled dial until desired surface speed shows in window. Then he aligns work diameter number with Hi-Lo lever to obtain correct spindle speed.

WHY WAIT LONGER?

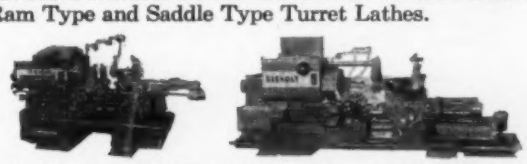
Get fast, smooth, effortless speed changes with Gisholt Hydraulic Speed Selector

A turn of this handwheel can influence your profit picture.

Offering a choice of pre-set or direct operation, the Gisholt Hydraulic Speed Selector eliminates time lost waiting for gears to shift. Your operator does not stop the spindle to make speed changes—nor does he release the main drive clutch. All he has to know are his work diameters. This means he can select the right spindle speeds quickly, effortlessly, without lengthy computation.

Consider what this means to your manufacturing processes: Because it is so *easy* for your operator to change speeds, he is continually encouraged to use the most effective speed for every operation, on all diameters, for all materials. Maximum tool life and a finer finish are obtained. Secondary operations are minimized. And your operator doesn't have to work as hard.

The Hydraulic Speed Selector is typical of the many advanced features on the new Gisholt MASTERLINE Ram Type and Saddle Type Turret Lathes.



Hydraulic Speed Selector is standard feature on Gisholt MASTERLINE Ram Type Turret Lathes (up to 16 spindle speeds, up to 25 hp. single-speed driving motor) and on Gisholt MASTERLINE Saddle Type Turret Lathes (up to 24 spindle speeds, up to 75 hp. single-speed driving motor).

GISHOLT MACHINE COMPANY

Madison 10, Wisconsin

ASK YOUR GISHOLT REPRESENTATIVE ABOUT FACTORY-REBUILT MACHINES WITH NEW-MACHINE GUARANTEE

Send new literature on MASTERLINE Turret Lathes, Ram ☐ Saddle ☐
Please have Gisholt representative call ☐

Fine tools that encourage Good Work

ARMSTRONG WRENCHES

An ARMSTRONG Wrench feels right—is balanced. It goes over nuts or screw heads easily, grips firmly without sloppiness, won't round corners—because openings are carefully machined to correct sizes. It's safe, strong beyond need without clumsy bulk—because of superior design and selected steels, heat treated to proper degree of hardness and tensile strength. It's quality finished, ARMALOY (alloy steel) Wrenches in chrome plate with heads buffed; HI-TEN (carbon steel) Wrenches in baked-on gray enamel with heads ground bright . . . all plainly marked for size. All are uniformly excellent tools manufactured under strict quality control, by modern methods, with modern equipment in a modern tool plant . . . 1537 different industrial sizes and types—single wrenches, or sets in metal cases, boxes or rolls . . . each a quality tool. Armstrong Wrenches are "Fine tools that encourage good work."

INDUSTRIAL DISTRIBUTORS · SERVING INDUSTRY ECONOMICALLY · THE RIGHT HAND OF PRODUCTION

If you don't know your local ARMSTRONG Distributor, we will send you the names of those in your area.

ARMSTRONG BROS. TOOL CO. 5215 W. ARMSTRONG AVE. · CHICAGO 46, U.S.A.

LET IT RAIN!

With USS Galvanized Steel Sheets—**the zinc stays on**

Gutters must resist corrosion. The steel *must* have a uniform coat of corrosion-resistant zinc that will not flake off when the gutter is formed. That's why Klauer Mfg. Co. in Dubuque, Iowa, uses USS Galvanized Steel Sheets. The zinc sticks to these sheets. They can be folded double, *then unfolded*, and no zinc flakes off the base metal! The result: a high-quality product, fully protected, for years of corrosion-free, maintenance-free life.

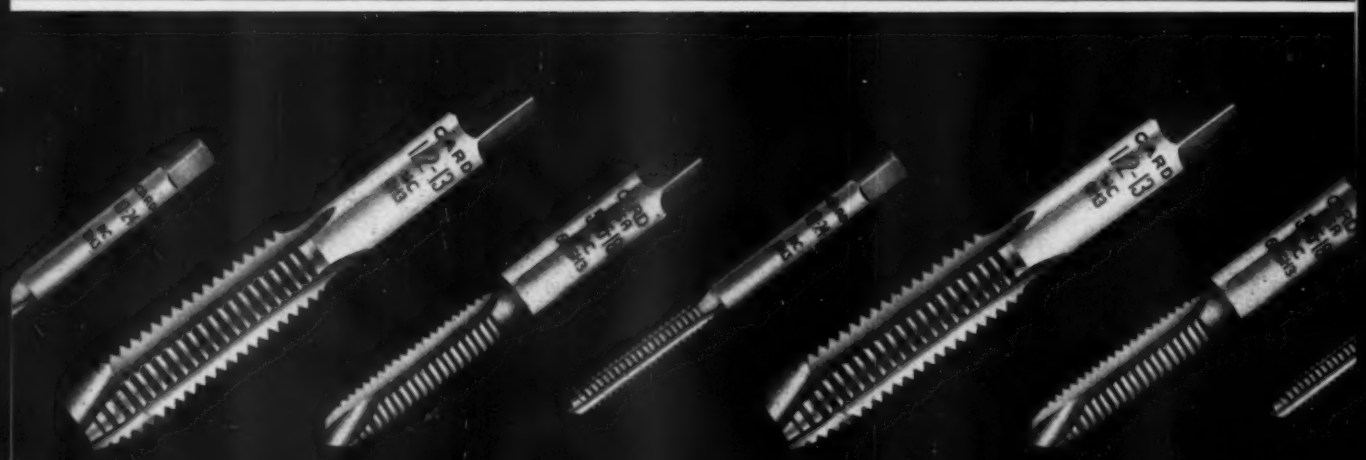
You can get the same results with USS Galvanized Steel Sheets. Call our local sales office or write to United States Steel Corporation, 525 William Penn Place, Pittsburgh 30, Pa.

USS is a registered trademark

United States Steel Corporation—Pittsburgh
Columbia-Geneva Steel—San Francisco
Tennessee Coal & Iron—Fairfield, Alabama
American Steel & Wire—Cleveland
United States Steel Supply—Steel Service Centers
United States Steel Export Company

United States Steel

As these electric light bulbs are uniform



...So Card special purpose taps are uniform, too

Your production's consistent ...because Card taps are uniform

Your first step in consistent production is the cutting tool itself. Because Card taps are identical — and available in many different surface treatments for specialized, difficult applications — they keep production up to par — and predictable. Shopmen know about the uniformity of Card taps — and gages. S. W. CARD DIVISION, Mansfield, Mass. Card Warehouses: Atlanta, Chicago, Detroit, Fort Worth, Los Angeles, New York, San Francisco.

The CARD Quality

CARD

DIVISION OF UNION TWIST DRILL COMPANY

—Serving you through the best distributors from Coast to Coast

CIRCLE 244 READER SERVICE CARD

If you use cutters as much as air tools use compressed air...

This brand cuts down your cutter usage, production time and costs!

The more you use cutters the more you need Union

Union cutters — best in design, materials and workmanship — provide consistent top performance and lowest cost per piece produced. Union makes solid milling and gear cutters, as well as inserted blade cutters — also drills, end mills, reamers, hobs and carbide tools.

Available nationally through Union Distributors and stocked in Union warehouses in Atlanta, Chicago, Detroit, Fort Worth, Los Angeles, New York City and San Francisco.

UTD

UNION

TWIST DRILL COMPANY, Athol, Massachusetts

S. W. CARD DIVISION, Mansfield, Mass.; BUTTERFIELD DIVISION, Derby Line, Vt.

See Your UNION DISTRIBUTOR for cutting tools that will save you time and money

CIRCLE 245 READER SERVICE CARD

Firth Sterling ...

PIONEER IN POWDER AND MOLTEN METALLURGY

Your assurance of results...

your guarantee of genuine Firthite in your blue-print tools

When you specify Firthite sintered carbide for your important blue-print tools, you count on top quality and money-saving performance. Now, Firth Sterling, in cooperation with leading toolmakers, offers a guarantee of quality unmatched in the industry.

This exclusive new service is designed to help you get maximum efficiency in your metal removal applications. It is typical of the progressive thinking that has characterized Firth Sterling during more than 68 years of metallurgical pioneering.

CERTIFICATION: To assure you that the exact grade of Firthite you specify goes into the cutting tools you buy, the bright, new label shown above will appear on the shank of each tool. It certifies a product engineered and quality controlled from ore to the finished tool—tools that cut faster, stay sharp longer and reduce downtime for regrinding. Firth Sterling and most leading toolmakers have agreed to apply this label *only* on tools using genuine Firthite.

* * * *

Insist on the Firthite label when you order blueprint tools—your certification of grade and quality. For further information on Firthite sintered carbide, or help with *any* metallurgical problem write: Firth Sterling, Inc., Dept. 91F, 3113 Forbes St., Pittsburgh 30, Pa. Warehouses and offices in principal cities.

Your Future Is Great in a Growing America

PRODUCTS OF *Firth Sterling* METALLURGY

HIGH SPEED STEELS • TOOL & DIE STEELS • STAINLESS SPECIALTIES • HIGH TEMPERATURE ALLOYS
SINTERED TUNGSTEN CARBIDES • HEAVY METAL • CERMETS • CHROMIUM CARBIDES
ZIRCONIUM • STERVAC & STERCON SUPER ALLOYS

FIRTH STERLING TRADE MARK

Are your lathes designed to profit from throwaway insert tools?

PROFIT POINT TURNING

Real profits come from decreased tool-change downtime and increased machine speeds

You can take full advantage of the savings made possible by throwaway insert tooling — elimination of sharpening and resetting costs, and decreased tool-change downtime — if you have a modern, high-speed lathe designed for carbides and ceramics. Chances are savings in tool-replacement costs plus greater production due to higher speeds and increased rigidity will amount to thousands of dollars a year, enough to pay for the new lathes you need badly to take full profit advantage.

The use of conventional speeds with throwaway insert tools is *wasteful*. And your profits are pegged *low* if you're using them on 20-year-old lathes that are underpowered for high-velocity turning. With perishable-tool costs so low in comparison with the cost of operating a lathe, the only sensible thing to do is boost machine speeds . . . burn up the cutting tool faster . . . really trim the fat out of the part price.

The speed at which tool costs and machining costs are in balance is your PROFIT POINT (see example above). But to operate at the right speed you need power, precision, and rigidity in lathes used with throwaway insert tooling—advantages your company will be glad to pay for in order to save time, floor space, and cost.

In other words, why put throwaway insert tooling on a "throwaway profit" machine tool?

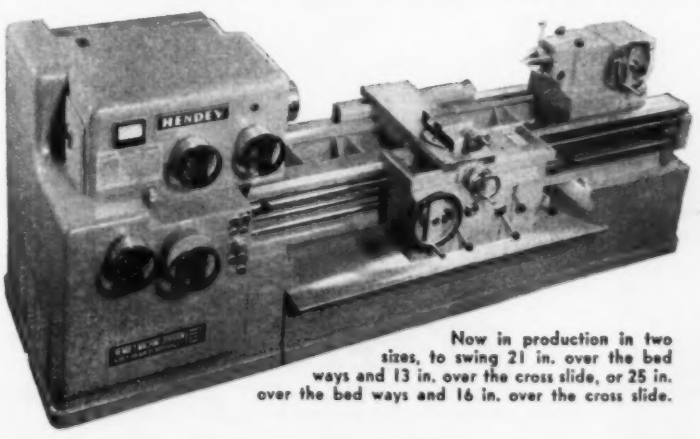
Example of PROFIT-POINT Turning		
Cost Item	Brazed Carbide	Throwaway Insert
Tool-change time	5 min.	2 min.
Cost per cutting edge	$1.27	$.25
Minimum cost tool life	40.4 min.	11 min.
Cutting speed for PROFIT-POINT turning	720 fpm 1000 rpm	980 fpm 1360 rpm
Machining time per piece	1 min.	.74 min.
Total time per piece (including nonproductive time per piece)	2 min.	1.74 min.
Machining cost per piece	$.15	$.11
Tool cost per piece	$.031	$.017
Nonproductive cost per piece	$.15	$.15
Pieces machined per hour	30	34
TOTAL COST PER PIECE	$.331	$.278

Barber-Colman's new 36-speed lathe is designed for PROFIT-POINT turning

Here's the machine that will give you precision work at the high speeds required for PROFIT-POINT turning with throwaway insert tools!

Look at the cross girth of the bed, extra-heavy cross slide, and rugged tailstock. Consider that this lathe will pull up to 25 hp through the spindle and operate at speeds up to 2000 rpm — yet you can get toolroom accuracy. And all the toolroom features, too, including: (1) multiple-thread indexing spindle, (2) built-in thread-chasing dial, (3) 66 threads, from 2 to 120 per inch, (4) reverse lever on apron, (5) automatic micrometer stops, (6) ball-thread-chasing stop on cross-feed screw, (7) hardened and precision-ground cross-feed screw and compound screw, (8) automatic, filtered lubrication to half nuts.

There are 36 spindle speeds through the geared head and 66 feed and thread changes, selected easily through two dials on the headstock. Write for complete facts on how this new Barber-Colman precision lathe will pay for itself quickly with throwaway insert tooling.



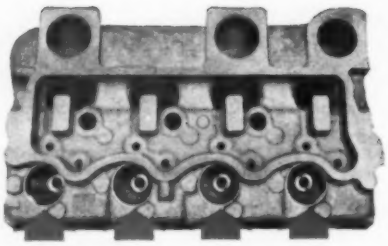
Now in production in two sizes, to swing 21 in. over the bed ways and 13 in. over the cross slide, or 25 in. over the bed ways and 16 in. over the cross slide.

Barber-Colman Company
111 Loomis Street, Rockford, Illinois

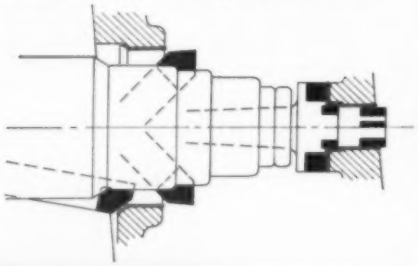
Don't expect a day's work for a day's pay on yesterday's machine tools

BARBER COLMAN ®

PRECISION LATHES



MACHINES 21 CYLINDER HEAD SURFACES IN ONE PASS WITH DEPTH OF CUT BETWEEN ⅛" AND 3/16"
Rough castings are bored, plunge-faced and chamfered at a rate of 18 parts per hour. Tooling is shown below.



NEW!

Heavy-Duty Precision Boring Machine

From base to bridge-top, Ex-Cell-O's new Style 771 Precision Boring Machine is engineered to keep pace with changing production needs and built to give years of precise profitable performance.

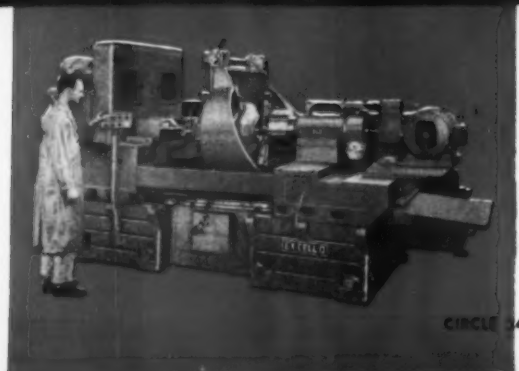
A specialist in fast, heavy-duty work such as the multiple machining operations detailed at left, the Style 771 (and the companion double-end Style 772) provides ample work space for complex tooling setups and bulky fixtures.

In-built versatility permits a broad range of rough, semi-finish and finish operations with automatic cycling. Rigid construction gives the "beef" needed for machining large, heavy parts, and supplies a wide margin of steadiness for high production of smaller precision parts.

Ex-Cell-O Precision Boring Machines can put greater precision into your products at lower per-unit cost. Get the full story from your local Representative, or write direct.

RIGHT: Style 771 machines both 4-and-6-cylinder tractor components. As cycle starts, table rapids to left, spindles rotate and feed traverse begins. At end of stroke, table rapids out to clear tooling; fixture indexes, cycle repeats for second set of holes.

BELOW: Double-end Style 772 performs multiple machining operations on tractor gear case cover.



XLO EX-CELL-O FOR PRECISION

EX-CELL-O CORPORATION *Machinery Division*
DETROIT 32, MICHIGAN

MANUFACTURERS OF PRECISION MACHINE TOOLS • GRINDING AND BORING SPINDLES • CUTTING TOOLS • TORQUE ACTUATORS • RAILROAD PINS AND BUSHINGS • DRILL JIG BUSHINGS • AIRCRAFT AND MISCELLANEOUS PRODUCTION PARTS • DAIRY EQUIPMENT

58-49

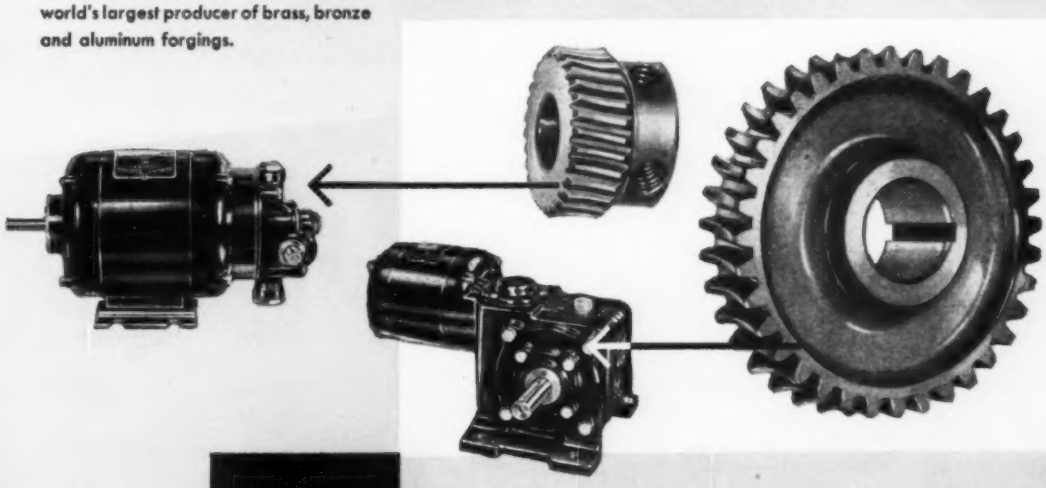
CIRCLE 348 READER SERVICE CARD

MUELLER BRASS CO. forged gears improve dependability and performance of BODINE electric motors

For combined high shear strength and maximum wear life in their single and double reduction speed reducer motors, Bodine Electric Company of Chicago uses gears forged from Mueller Brass Co. 603 Alloy.

Bodine has specified Mueller Brass Co. forged gear blanks because of their consistently high quality . . . there is no porosity, foreign inclusions or defects typical of cast blanks. The hot working of the metal followed by heat treatment to the desired physical properties produces a refined grain structure to give uniform machining and wear in service. The forged blanks are consistent in size and held to close tolerances. Bodine has also found that the excellent machinability of the blanks in the hobbing operation increases overall hob life.

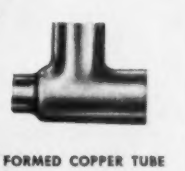
For forgings of high tensile strength, high density, minimum porosity, light weight, corrosion resistance, good machinability and low costs with little scrap loss, it pays to specify forgings from the Mueller Brass Co., the world's largest producer of brass, bronze and aluminum forgings.



only the man from Mueller Brass Co.

can offer unbiased advice on the "one best way" of producing your parts, because Mueller Brass Co. is the *only* fabricator in the country offering all these methods of production . . . assuring you the best product at the best price . . . made the one best way.

Write today for complete catalogs on any of these products.



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PLASTICS INJECTION MOLDING

COLD-PREST IMPACT EXTRUSIONS

SCREW MACHINE PRODUCTS

POWDER METAL PARTS

RED BRASS CASTINGS

Also producers of: Super Cutting Red Tip Brass Rod • Aluminum Extrusions Aluminum Sheet, Coil and Strip • Plastic Pipe and Fittings • Copper Tube and Solder Type Fittings •

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262

metalworking's most effective two-edged sword...

... the 8th American Machinist Inventory of Metalworking Production

Equipment

Published November 17, 1958, the 8th American Machinist Inventory of Metalworking Production Equipment is a unique industrial publishing enterprise.

Classified by age, type, industry and location are all the industrial Metalworking machines in the United States — over three million units.

Application of the Inventory (which has appeared every five years since 1925) is a double-edged sword for building sales in the Metalworking field.

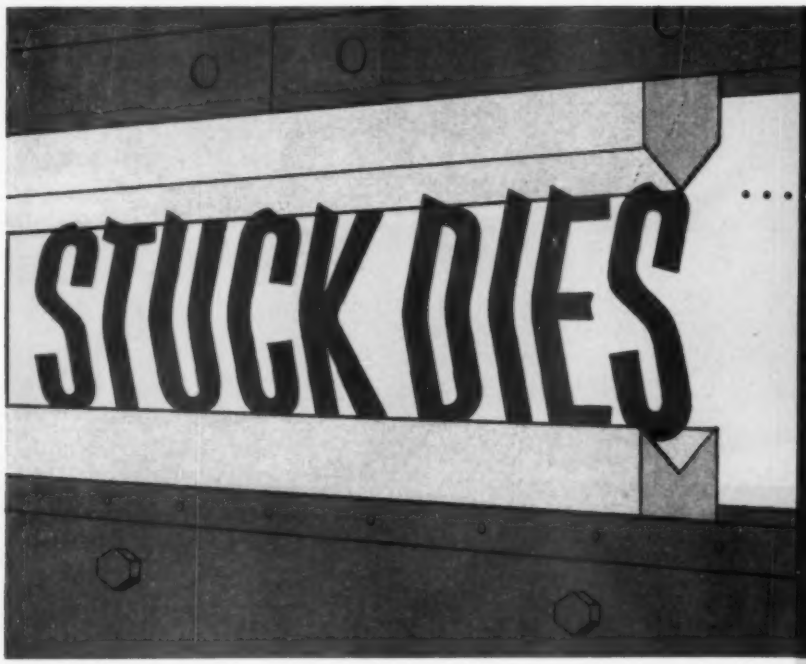
To production engineers and executives in Metalworking plants, the Inventory is a valuable obsolescence "yardstick" that allows comparison of production facilities with competition, with local plants, with the nation.

To suppliers of equipment, accessories, materials and supplies to Metalworking, the Inventory is an invaluable sales blueprint; an overall market picture that shows areas of greatest sales potential.

This is publishing service to industry — the type of endeavor that has made American Machinist the nation's leading Metalworking publication.

McGRAW-HILL MAGAZINE OF METALWORKING PRODUCTION
330 WEST 42nd STREET, NEW YORK 36

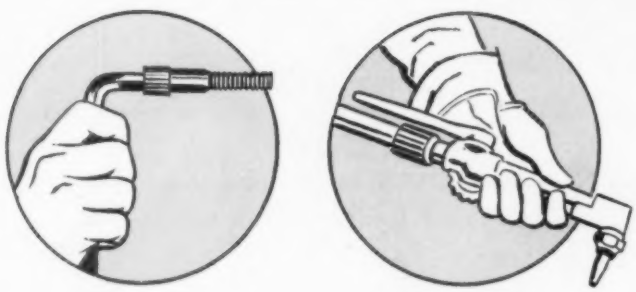
American Machinist



STUCK DIES

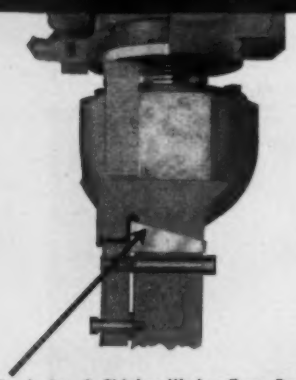
. . . quickly, easily released with exclusive patented LODGE & SHIPLEY

WEDGE TYPE RAM PRESSURE RELEASE



THIS . . . **NOT THIS!**

- **Use wrench . . . . . not a cutting torch**
- **in minutes . . . . . instead of hours**
- **without damage . . . . die holder destroyed**

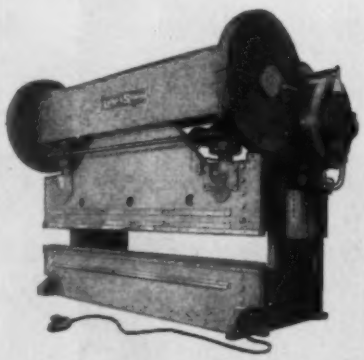


The Lodge & Shipley Wedge Type Ram Pressure Release is unusually simple and rugged in design. A heavy steel wedge has a top angle that complements a similar angle on the base of the ram pitman socket housing. Held securely by a heavy steel plate, the wedges can be released quickly to provide up to ¼" additional clearance.

When a press brake is stalled due to improperly adjusted dies . . . do you face a short delay or near disaster?

With a Lodge & Shipley Press Brake, release of the stuck dies is a quick, simple, non-destructive matter as described in the accompanying detail.

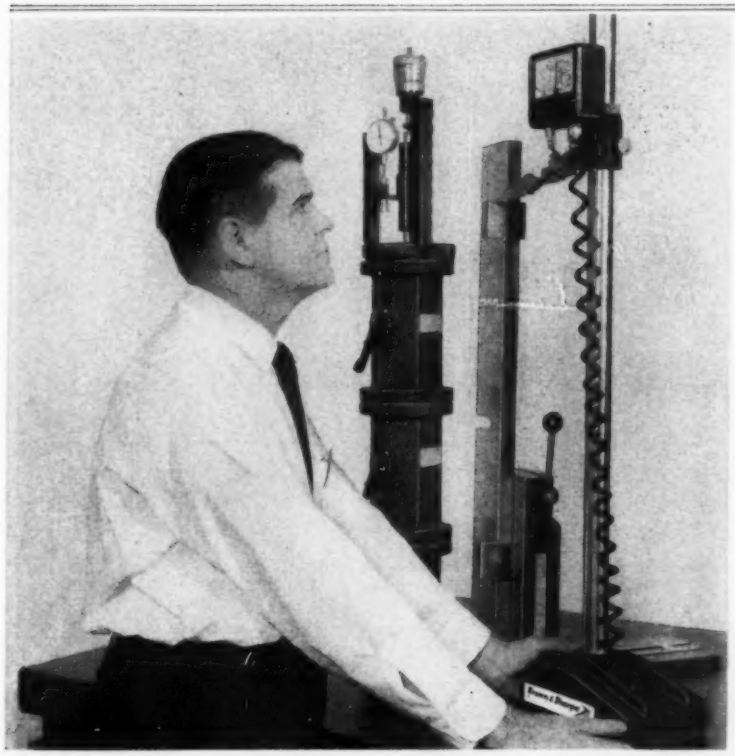
This is but one of many outstanding Lodge & Shipley Press Brake features designed for fast, accurate, efficient and dependable press brake operation. New literature gives complete details. Write: **The Lodge & Shipley Co., 3056 Colerain Ave., Cincinnati 25, Ohio.**



Lodge & Shipley *. . . your Lodge-ical choice*

Precision Tool News

NO. 8 B·S REPORTING NEW DEVELOPMENTS AT BROWN & SHARPE'S PRECISION CENTER



New B&S Transistorized Electronic "Super Hite-Chek" Offers .000005″ Accuracy, Needs No External Connections, is Easy to Use

BROWN & SHARPE has developed the first height-transferring tool that combines the friction-free *accuracy* of electronic measuring with the compact *convenience* of an ordinary height gage. The No. 581 Super Hite-Chek is self-powered, self-contained, easily carried to surface plate or machines.

Its indicating meter travels *on the same slide* with the gage head . . . connects neatly to a battery-powered, transistorized amplifier *in the tool's base*. Measurements are repeated accurately within .000005″ over a 0″ to 36″ range . . . easily, because the meter is always at the measuring height, and there are no external cords, power supplies or other components to "get in the way". The batteries are long-lived, inexpensive, easily replaced.

For rough adjustment, the slide is moved and the gage head tilted "to contact" by a knurled nut. A selector knob on the tool base is turned to "Battery Test" (needle should swing off-scale to right) and then "On". Fine adjustment is made electronically by turning the "Zero Adjust" knob until the meter needle centers on "O". The meter reads from minus .0005″ to plus .0005″ and spreads each .0001″ out about ¼″ on its scale; each division is .000025″. Gage head is reversible for measuring "under" surfaces. Range: 0″ to 36″.

New "Ready Mark" Air Hardening Flat Stock Available for "Low Distortion" Applications

261 sizes of precision ground tool steel designed for air hardening have been added to the Brown & Sharpe Ready Mark line. Containing 5% chrome, this stock is ideal for dies or other work where distortion during hardening must be minimized. Comes coated with a smooth, maroon finish, all ready for scribing.

New B&S 8″ Vernier Height Gage Measures Small Work at Less Cost, Fits in Tool Chest

Brown & Sharpe's No. 587 0″–8″ Vernier Height Gage is more economical for small work than larger tools; handier to use. Offers features for greater accuracy and convenience, including flush vernier plate, and two-way marker that measures "under" as well as "over" surfaces.

Your B&S Distributor Offers These Tools at Factory Prices

He stocks a complete B&S line, including the very newest tools and he has factory-trained salesmen with a thorough understanding of your requirements. You can always rely on your nearby B&S distributor for prompt delivery at factory prices. Brown & Sharpe Mfg. Co., Providence 1, Rhode Island.

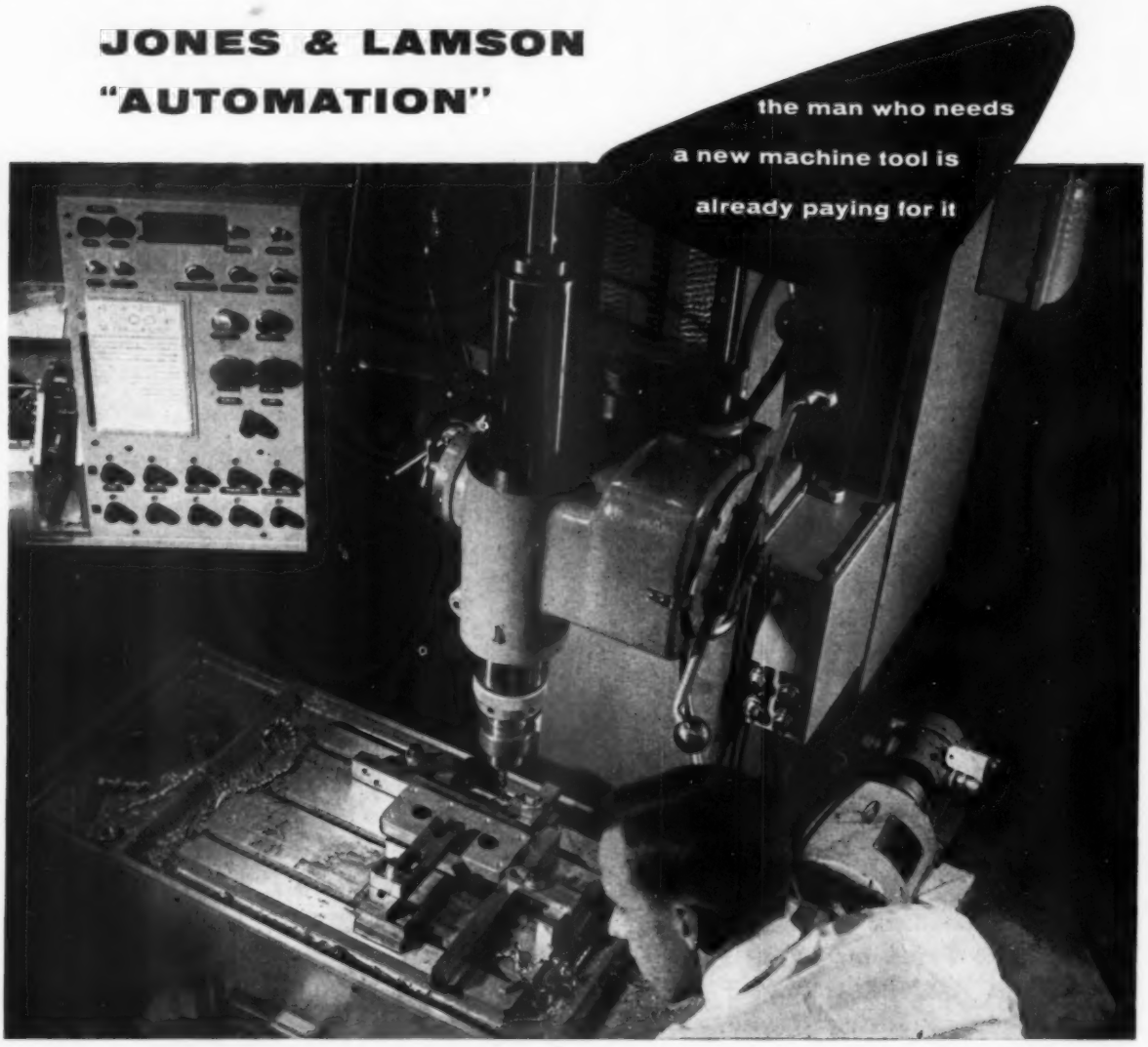
PROGRESS IN PRECISION FOR 125 YEARS

Brown & Sharpe B·S

PRECISION TOOLS AND GAGES • MILLING, GRINDING AND SCREW MACHINES • CUTTERS • MACHINE TOOL ACCESSORIES • PUMPS AND HYDRAULIC PRODUCTS

JONES & LAMSON "AUTOMATION"

the man who needs a new machine tool is already paying for it



Numerical control positioning eliminates jigs – saves time

The J&L Numerically Controlled Positioning Table quickly and accurately positions work pieces to an accuracy of ±.001″ — without jigs. And it can do it economically with any lot size down to a single piece.

For instance: in one installation, where precision parts previously had been machined on a conventional spacing table, J&L's new equipment achieved cycle time savings of six minutes per piece and set-up savings of over 116 minutes per set-up, or a total savings of 6.95 hours on a lot of 50 pieces.

In another plant, the cost of building $4,000 worth of jigs was eliminated during the first six weeks of operation. And in still another operation, the positioning table not only reduced set-up and cycle time, but also eliminated the storing, handling and maintenance of $29,000 worth of jigs.

You can get in on this kind of savings too. Write to Jones & Lamson Machine Company, 502 Clinton Street, Springfield, Vermont.

Turret Lathes • Fay Automatic Lathes • Milling & Centering Machines • Thread & Form Grinders • Optical Comparators • Thread Tools

Missing Something ?

The Answer is Pink !

Switch to PINK CIMCOOL

Yes, if you're missing that extra something in *your* shop, try CIMCOOL for metal cutting jobs. The famous CIMCOOL° family of cutting fluids covers every job, every type of work and metal. Discover how the famous pink cutting fluid can lower costs and increase production in your plant.

Here are three reasons why CIMCOOL has become the largest selling chemical cutting fluid in the world:

CIMCOOL LOWERS COSTS because it's longer lasting in machines. Therefore, it reduces downtime and cuts labor costs for cleaning and changing.

CIMCOOL PERMITS FASTER SPEEDS and feeds, because of its chemical lubricity. It combines friction reduction and cooling capacity in a degree never before attained by old fashioned lubricants.

CIMCOOL IS CLEANER TO USE because it doesn't soil hands or clothing. It contains no skin irritants. And it's safer because it leaves no slippery film on shoes, floor, machine or work. It can't smoke, can't burn, and virtually eliminates rancidity and foul odors.

So don't keep things *under* your hat . . . call your CIMCOOL Distributor today. He'll be glad to give you full information on all the advantages of CIMCOOL Concentrate—as well as details on the entire family of CIMCOOL Cutting Fluids. YOU may be missing something!

Or contact us direct and we'll have one of our Cincinnati Milling trained machinists call on you—without cost or obligation, of course. Write, wire or telephone, Sales Manager, Cincinnati Milling Products Division, Cincinnati 9, Ohio.

CIMCOOL CUTTING FLUIDS

CIMCOOL **52 Concentrate**—The famous pink fluid which still covers 85% of all metal cutting jobs. Effective, economical and clean.

CIMPLUS—The transparent grinding fluid with exceptional rust control. Also used for machining cast iron and as a water conditioner with CIMCOOL Concentrate.

CIMCUT **Concentrates (AA, NC, SS)**—For jobs requiring oil-base cutting fluids. Added to mineral oils, they give economical mixes for higher speeds and feeds.

CIMCOOL **Tapping Compound**—Permits the use of highest tapping speeds and increases tap life amazingly.

Also, CIMCOOL Bactericide and CIMCOOL Machine Cleaner.

for 100% of all metal cutting jobs. The Answer is Pink!

Production-proved products of The Cincinnati Milling Machine Co.

° Trade Mark Reg. U.S. Pat. Off.

The Aluminum Man*...

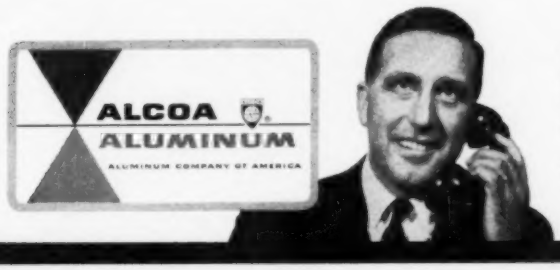
*The 18 years' experience of Gordon Coppins—salesman for Alcoa Distributor Brace-Mueller-Huntley, Inc., with headquarters in Syracuse, N.Y.—is typical of the men who serve American enterprise through intimate knowledge of the miracle metal . . . aluminum!

He helps blueprint building progress

When construction requirements are for architectural extrusions that dependably combine *high strength* with *light weight* and *low cost*—in a metal inherently resistant to corrosion—*The Aluminum Man* provides the right answer for more of business and industry, more and more!

He is your Alcoa distributor salesman. And he offers the most complete selection of *aluminum* architectural extrusions in the industry. Behind him—and the design and alloy recommendations he makes—stands intensive and detailed mill-training by Alcoa, pioneer in aluminum application research for 70 years!

Call *The Aluminum Man* on your next building problem. His service and assistance are as close at hand as your telephone...and they are available to you whether you need a *few* pounds or *thousands* of pounds of Alcoa® Aluminum ...the light metal with the bright future that's being seen in more places . . . more and more!



Call *The Aluminum Man*
He's your Alcoa Distributor Salesman
for sheet, tube, shapes
and other Alcoa Mill Products

ALABAMA
Birmingham
Hinkle Supply Co., Inc.
FAirfax 2-4541
The J. M. Tull Metal &
Supply Co., Inc. ... FAirfax 3-1612

ARIZONA
Phoenix
Ducommun Metals & Supply Co.
BRidge 5-4471

CALIFORNIA
Berkeley
Ducommun Metals & Supply Co.
THornwall 1-1820
Los Angeles
Ducommun Metals & Supply Co.
LUdlow 8-0161
Pacific Metals Company, Ltd.
RAymond 3-5431
San Diego
Ducommun Metals & Supply Co.
GRidley 7-3141
San Francisco
Pacific Metals Company, Ltd.
UNderhill 3-5600

COLORADO
Denver
Marsh Steel Corp., KEystone 4-1241
Metal Goods Corp., DUdley 8-4141

CONNECTICUT
Milford
Edgcomb Steel of New England, Inc.
TRinity 4-1631
Windsor
Whitehead Metal Products Co., Inc.
MUrdock 8-4921

FLORIDA
Jacksonville
The J. M. Tull Metal &
Supply Co., Inc....EVergreen 7-5561
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The J. M. Tull Metal &
Supply Co., Inc. ... NEwton 5-0365
Tampa
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Supply Co., Inc. ... 3-6741

GEORGIA
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The J. M. Tull Metal &
Supply Co., Inc. ... JAckson 5-3871

IDAHO
Boise
Pacific Metal Co. ... 3-6468

ILLINOIS
Chicago
Central Steel & Wire Company
REpublic 7-3000
The Corey Steel Co., BIshop 2-3000
Steel Sales Corp. ... BIshop 7-7700

INDIANA
Indianapolis
Steel Sales Co. of Indiana, Inc.
LIberty 6-1535

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Marsh Steel Corp., WHitehall 2-3231
Metal Goods Corp., AMherst 5-3191

KENTUCKY
Louisville
Williams & Co., Inc., JUniper 3-7781

LOUISIANA
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Metal Goods Corp., JAckson 2-7373

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Whitehead Metal Products Co., Inc.
EAstern 7-3200

MASSACHUSETTS
Cambridge
Whitehead Metal Products Co., Inc.
TRowbridge 6-4680
Roxbury
Eastern Metal Mill Products Co.
Highlands 2-5900

MICHIGAN
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Central Steel & Wire Company
TWinbrook 2-3200
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TYler 6-3000

MINNESOTA
Minneapolis
Steel Sales Co. of Minnesota
STerling 1-4893

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Kansas City, North
Marsh Steel Corp. ... GRand 1-3505
Metal Goods Corp. ... GRand 1-3516
St. Louis
Metal Goods Corp., HArrison 7-1234
Steel Sales Co. of Missouri, Inc.
PRospect 1-5255

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Nashua
Edgcomb Steel of New England, Inc.
TUxedo 3-7731

NEW JERSEY
Harrison
Whitehead Metal Products Co., Inc.
HUmbolt 5-5900
Hillside
Miller Steel Co.,Inc., WAverly 6-6000
Kenilworth
Jones & Laughlin Steel Corp.
MUrdock 6-6900

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Eastern Metals Warehouse, Inc.
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Brace-Mueller-Huntley, Inc.
Victoria 8700
Whitehead Metal Products Co., Inc.
BEdford 3100
New York
(Brooklyn) Strahs Aluminum
Company, Inc., BRowning 2-7000
(L. I. City) Adam Metal Supply, Inc.
STilwell 6-7737
Henry B. Lust (circles)
CIrcle 6-1748
Manhattan Brass & Copper Co.
WOrth 6-1200
Whitehead Metal Products Co., Inc.
WAtkins 4-1500
Rochester
Brace-Mueller-Huntley, Inc.
COngress 6-6560
Metal Supply, Inc. ... LOcust 2-4260
Sachs Metal Supply Co.
FAirview 8-1710
Syracuse
Brace-Mueller-Huntley, Inc.
HOward 3-3341
Whitehead Metal Products Co., Inc.
GRanite 4-4641

NORTH CAROLINA
Charlotte
Edgcomb Steel Co., FRanklin 5-3361

OHIO
Cincinnati
Central Steel & Wire Company
AVon 1-2230
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Steel & Aluminum Division
ATlantic 1-5100
Williams & Co., Inc. ... UTah 1-5000
Columbus
Williams & Co., Inc.
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Dayton
Ohio Metal & Manufacturing Co.
CLearwater 3-4192
Toledo
Williams & Co., Inc.
GReenwood 5-8661

OKLAHOMA
Tulsa
Metal Goods Corp. ... GIbson 7-4101

OREGON
Portland
Pacific Metal Co. ... CApitol 7-0693

PENNSYLVANIA
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Edgcomb Steel Co., GArfield 3-6300
Metal Supply Co., STevenson 7-0220
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BAldwin 9-2323
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Williams & Co., Inc. ... CEdar 1-8600
York
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RHODE ISLAND
Slatersville
Edgcomb Steel of New England, Inc.
POplar 7-0900

TENNESSEE
Memphis
Metal Goods Corp., WHitehall 8-3407

TEXAS
Dallas
Metal Goods Corp., FLeetwood 1-3271
Houston
Metal Goods Corp. ... FAirfax 3-0141

UTAH
Salt Lake City
Pacific Metals Company, Ltd.
DAvis 2-3461

WASHINGTON
Seattle
Pacific Metal Co. ... MAin 2-6925

WISCONSIN
Milwaukee
Central Steel & Wire Company
HUmboldt 1-5000
Steel Sales Co. of Wisconsin
HIlltop 2-2020

Aluminum Products—Hawaii,
Honolulu 14, **HAWAII**

Aluminum Company of America, 956-L Alcoa Building, Pittsburgh 19, Pennsylvania

CIRCLE 257 READER SERVICE CARD

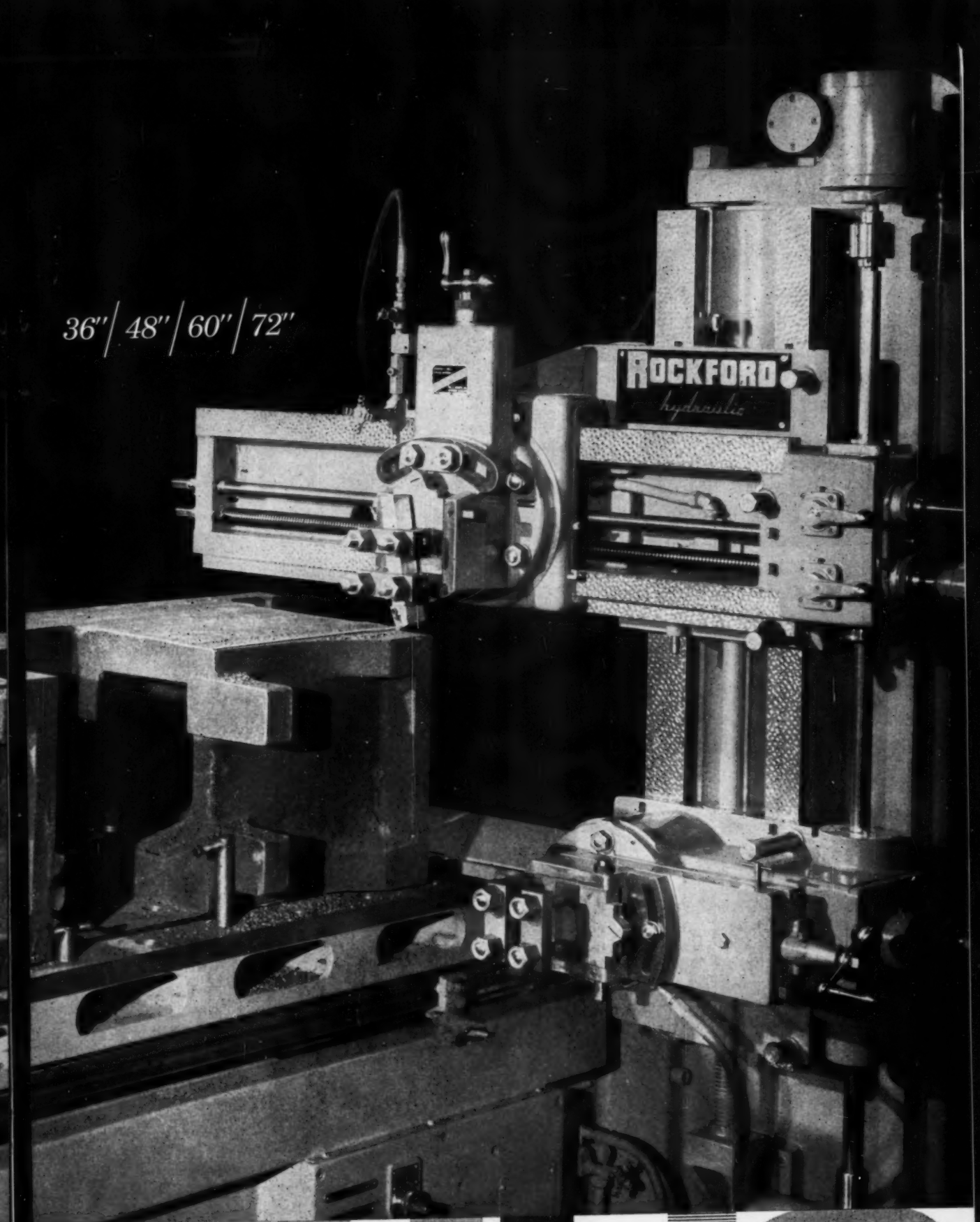
ROCKFORD MACHINE TOOL CO. 2500 KISHWAUKEE STREET ROCKFORD, ILLINOIS

DON'T SPEND BIG MONEY TO DO BIG JOBS!

Put them on a Rockford Hy-Draulic Openside Shaper

HY-DR

CIRCLE 258 READER SERVICE CARD



AULIC

CIRCLE 259 READER SERVICE CARD

TECHNITE® POWER HACK SAW BLADES

stay hard, sharp and accurate

cut

after cut

after cut

See Your Capewell Distributor

CAPEWELL

THE CAPEWELL MFG. CO.
HARTFORD 2, CONN.

Letters...

To American Machinist
330 W 42nd St, NY 36, NY

Better training needed

Dear Sirs:
One of the errors in "industrial thinking" in this country is clearly illustrated by an ad in a recent issue of *American Machinist*. The ad shows a machine tool that costs upward of $75,000; yet the operator does not have the training and/or the common sense to clamp his work to the table properly.

This trend is commonplace throughout industry in this country. Millions of dollars are spent on good tools and machines, but how much is spent on training good mechanics to operate them and maintain them?

As a result you see many fine tools and machines not performing to capacity or rapidly going to pieces because of bad handling.

Just had to get this off my chest.

Nils T Siren
Olathe, Kans

Reader Siren has sharp eyes. The ad shows an end mill poised over a piece of work that is held down by only a screw and a loose flat washer at each corner.

The setup is a poor one. An advertising copywriter might not recognize this, but the setup man in the plant where the picture was taken should—Ed.

Acid hands

Dear Sirs:
I have a problem that apparently is an old one, and yet I can't find an answer to it.

I have working for me a very good man who has acid hands. His condition is so bad that he can just point his finger at a newly ground surface, and the next morning it is covered with rust. He is too good a man to let go, and yet every tool in the place is getting rusty now. He does grinding, so I can't ask him to rub oil all over his hands.

I wonder if there might be some non-greasy, commercial preparation that he might put on his hands to counteract this. We will be grateful for any information you might give us.

R C Hoard
Anaheim, Calif

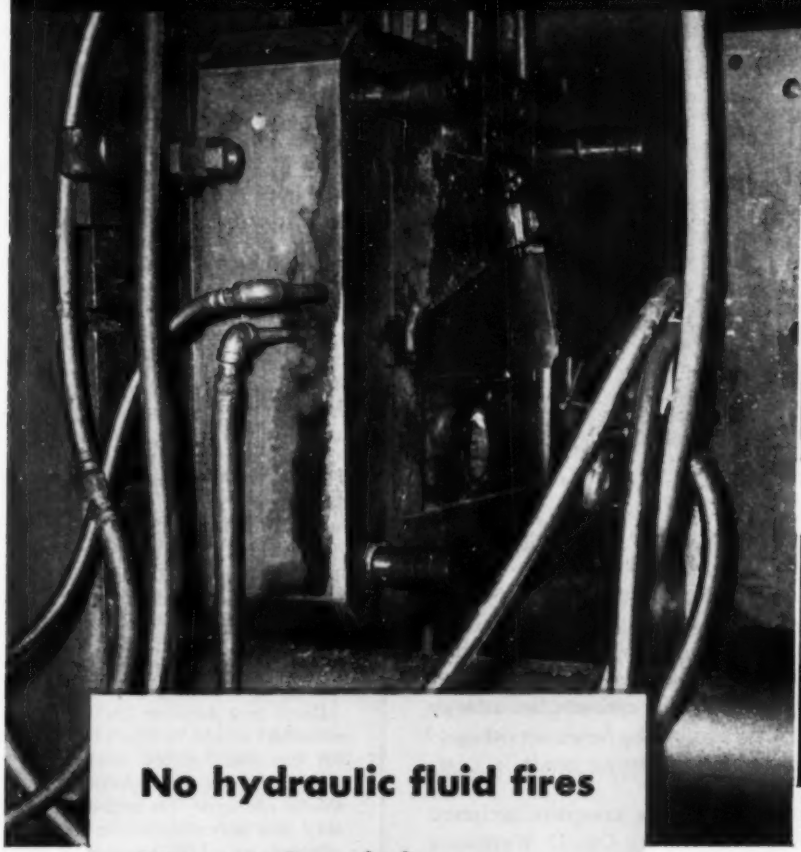
Reader Hoard is correct. It's an old problem, but it's not an every-

SHOPMATES

N. Jarvis

HALP!! LEMME DOWN!! HEY!!
CLANK
HE'S ALWAYS GOT SO MUCH JUNK AND TOOLS IN HIS HIP POCKETS IT'S A WONDER HE AIN'T BEEN STRUCK BY LIGHTENING!!
OLD IRON PANTS!!
N. JARVIS

"For 3 solid years—



Irus Fluid's distinctive yellow color makes it easy to spot and trace leaks.

Complexity of lines (left) and pots of molten metals (above) represent the type of fire hazards requiring Shell Irus Fluid 902.

No hydraulic fluid fires

No worker injury

No equipment damage —since we switched over to SHELL IRUS FLUID 902"

says Ernie Ike, Plant Superintendent
Western Die Casting Co., Emeryville, Calif.

According to Mr. Ike, these results are directly due to the switch-over in 1955 from conventional hydraulic fluids to Shell Irus Fluid 902.

Irus® Fluid 902 is a special combination of petroleum oils mixed with water and emulsifying agents. Its fire resistance is achieved through the relatively high water content. Irus snuffs out fire, *under plant conditions.*

Another important advantage of Irus Fluid 902 is its low cost. Plant operators now using Irus have discovered that Irus Fluid costs up to one-third less than other fire-resistant fluids . . . yet is comparable in performance in every practical respect.

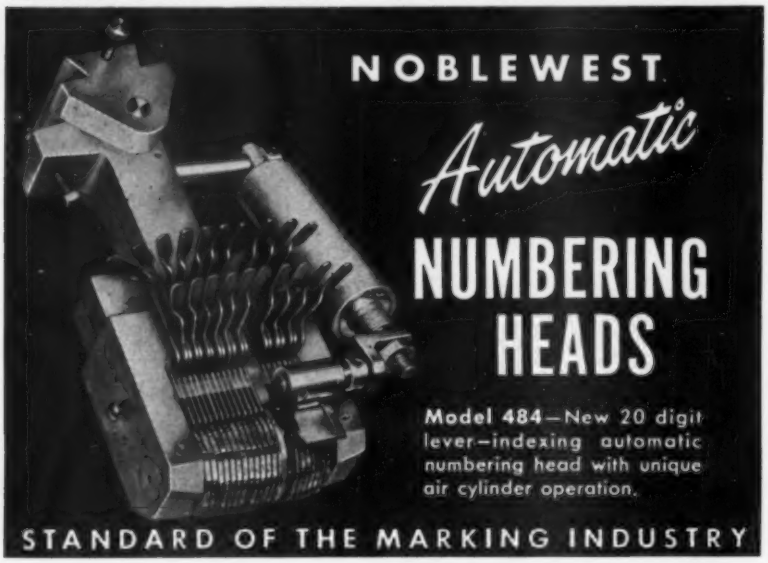
If the hydraulic equipment in your plant is exposed to fire hazards, let a Shell Industrial Representative show you the advantages of Irus Fluid 902. Write Shell Oil Company, 50 West 50th St., New York 20, N. Y. or 100 Bush St., San Francisco 6, Calif.

SHELL IRUS FLUID 902

a low-cost, fire-resistant hydraulic fluid

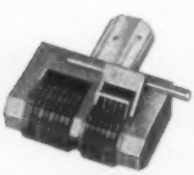
SHELL

LEADERS IN INDUSTRY MARK WITH NOBLEWEST

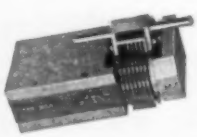


Noblewes: Numbering Heads are unsurpassed in precision, speed of operation and long life for every kind of *permanently* indented numbering. They are the product of master craftsmen using only the finest selected steels. Made for use in either marking presses or Noblewest Roll Marking Machines, they are available in a wide range of automatic, non-automatic and lever operated models, a few of which are illustrated here. Applications are unlimited for constant, selective or consecutive (serial) numbering. Special numbering heads are designed and made for any requirement, including embossing heads.

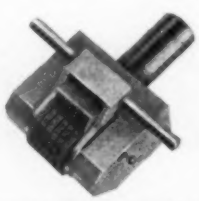
Send for Numbering Head Catalog containing complete technical information. Noble & Westbrook Manufacturing Co., 17 Westbrook St., East Hartford 8, Conn.



Model 129—Combination numbering head. One section has automatic operation for serial numbering—second section is non-automatic for selective numbering.



Model 131 — Automatic numbering head with extended frame to accommodate marking die or interchangeable steel type.



Model 10 — Standard Automatic Numbering Head. Carried in stock in 6 and 7 wheels. Number sizes: 1/16 - 3/32 - 1/8 - 5/32 - 3/16.

A few desirable territories open to qualified representatives

MARK IT BEST WITH NOBLEWEST IMPROVED MARKING DEVICES

NOBLEWEST

ORIGINATORS OF THE ROLL MARKING PROCESS

MARKING
NUMBERING
EMBOSSING
GRADUATING

day problem for most shops. However, we can suggest two skin creams. One is Ply 29, made by Milburn Co, East Woodbridge at Walker, Detroit, Mich. The other is Kerodex 71, a product of Ayerst Laboratories, 22 East 40th Street, New York, NY.

If any of our readers have other suggestions on the way to solve this problem, we will be glad to forward them—Ed.

Not so safe, after all

Dear Sirs:

I read with interest your article on the "Aircraft and Missiles" page concerning the 1209 Atlas suppliers (*AM*—Sept 22 '58, p79).

The statement that 5000 plants in 32 states would make a pretty tough target for anybody's air force is quite true, that is if they all were in a position to assemble the end product and build all of the complex components.

The sad thing about the situation is that an air force concerned about the Atlas program would need only destroy the Convair Astronautics plant in San Diego, making the 4999 plants ineffective regarding this program.

Don't you believe that an all-out effort would be made to knock out the heart of the program or some complex component which would paralyze the heart? Probably this decentralization isn't as effective as might appear on the surface.

Name Withheld
San Diego, Calif

Helpful Henry

by L Hoppes

"Must be a nerve wracking job,—let me help steady your brush,—Oops!"

CALENDAR

National Tool & Die Manufacturers Association—Annual Convention, Nov 5-9, Sheraton Hotel, Philadelphia.

Society of Vacuum Coaters—Fall Meeting and Technical Conference, Nov 5-6, Hotel Statler, Detroit, Mich.

Society of the Plastics Industry—Annual Conference and Exposition, Nov 17-21, International Amphitheater and Morrison Hotel, Chicago, Ill.

American Society of Mechanical Engineers — Annual Meeting, Nov 30-Dec 5, Statler and Sheraton-McAlpin Hotels, New York, NY.

Society of Automotive Engineers—Annual Meeting and Engineering Display, Jan 12-16, Sheraton-Cadillac and Statler Hotels, Detroit, Mich.

American Society of Mechanical Engineers — Aviation Conference, Mar 8-12, Statler-Hilton Hotel, Los Angeles, Calif.

American Society for Metals — Western Metal Exposition and Congress, Mar 16-20, Pan-Pacific Auditorium and Ambassador Hotel, Los Angeles, Calif.

Society of Automotive Engineers—National Production Meeting, Mar 19-20, Sheraton-Cadillac Hotel, Detroit, Mich.

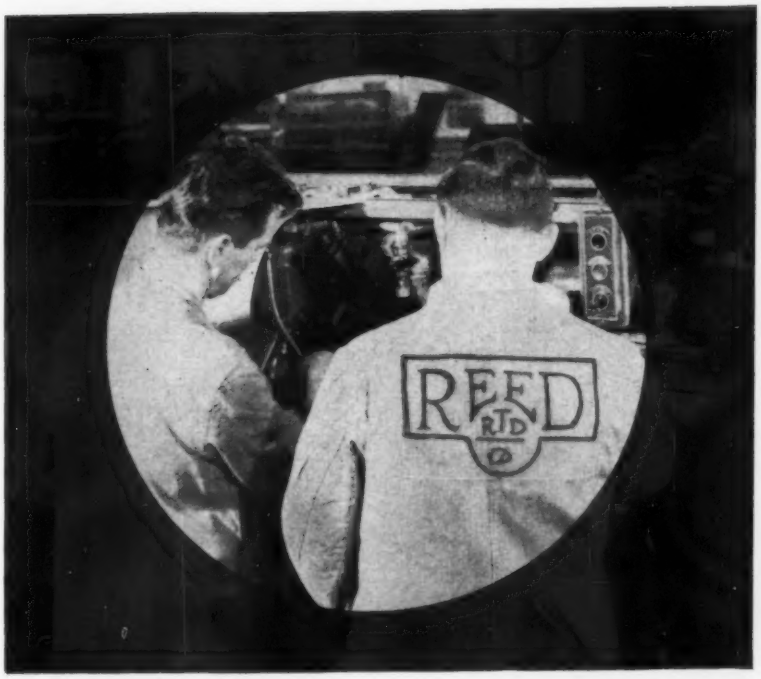
Society of Automotive Engineers—Aeronautic Meeting and Display, Mar 31-Apr 3, Hotel Commodore, New York, NY.

American Welding Society—Annual Convention and Meeting, Apr 6-10, Sherman Hotel and Donovan Hall, Chicago, Ill.

American Society of Mechanical Engineers—Metals Engineering Conference, Apr 29-May 3, Sheraton-Ten Eyck Hotel, Albany, NY.

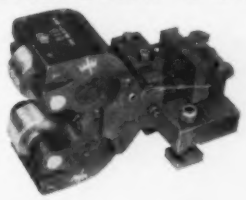
American Foundrymen's Society—Engineered Castings Show, April 13-17, Sherman and Morrison Hotels, Chicago, Ill.

American Society of Tool Engineers—Annual Meeting, Apr 18-22, Schroeder Hotel, Milwaukee, Wis.

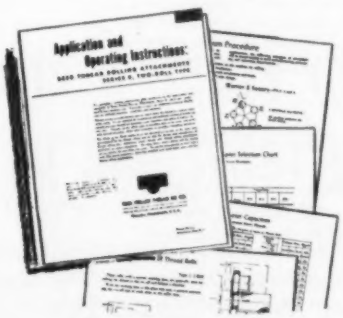


Reed's Customer Service Plan

guarantees top thread rolling performance of your Reed Attachment



Highly skilled Reed personnel assist with initial installation and give a thorough training on the use and operation of the attachment. This personal service assures complete satisfaction in the operation of your Reed Attachment.



Complete technical information is furnished in the application and operating instructions booklet. With this booklet setup men without previous thread rolling experience have successfully completed setup for production.

Write for your copy of Thread Rolling Attachment Bulletin B-2 for helpful information on Thread and Form Rolling

REED RTD TRA-169

REED ROLLED THREAD DIE CO.

Specialists in Thread and Form Rolling Tools and Equipment

WORCESTER 1, MASSACHUSETTS, U. S. A.

Sales Offices in: Buffalo, Chicago, Cleveland, Compton, Calif., Denver, Detroit, Englewood, N. J., Houston, Indianapolis, Milwaukee, Montreal, New York City, Phila., Pittsburgh, St. Louis, Syracuse, Toronto

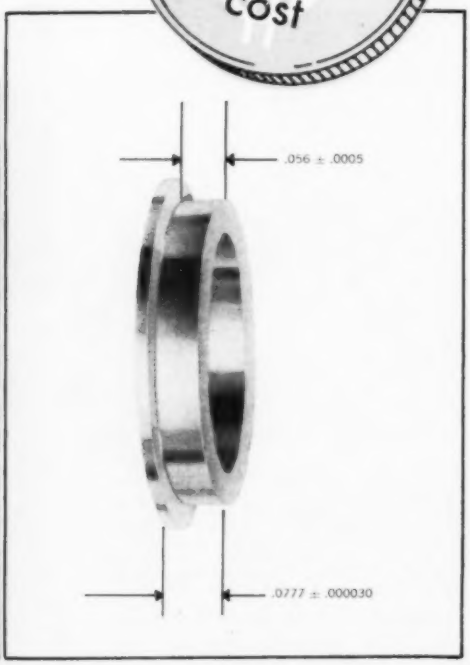
BURROUGHS PLANT REPORTS:

Norton No. 12 HYPROLAP* Machine

boosts production rate 1100% per hour . . .

saves time... reduces cost

In the Plymouth Division of the Burroughs Corporation at Plymouth, Michigan production men recognized the productive possibilities of this NORTON #12 HYPROLAP High Production Lapping Machine and now use it to finish spacer collars at over 11 times the speed of the two surface grinders previously used. Rotating carriers bring the collar between the upper and lower laps. Work pieces are automatically fed and ejected. Besides hitting a new high in production, Burroughs also has eliminated the grading and selecting of finished pieces through the extreme productive accuracy of this advanced NORTON lapping machine.



On the #12 HYPROLAP machine the upper lap refines the surface quality of the hub face of the spacer collar, holding the .056" dimension. The lower lap finishes the flange face, producing the .0777" thickness dimension within ±.000030" instead of ±.0001" as in the former method.

As proved in the Burroughs plant, the No. 12 HYPROLAP high production lapping machine offers many advantages over conventional finishing methods. Equipped with bonded abrasive laps, this parallel face flat lapping machine is available with automatic or semiautomatic continuous feed. Both arrangements provide fast lapping . . . continual operation with only occasional lap dressing . . . a wide range of selective speeds for laps and work holders . . . finished work washed clean, eliminating extra cleaning operations.

For further details on how this combination of speed and accuracy can improve your own finishing operations, see your Norton Representative or write us direct for Catalog No. 2359-1. And remember: only Norton offers you such long experience in both grinding machines and grinding wheels to bring you the "Touch of Gold" that helps you produce more at lower cost. NORTON COMPANY, Machine Division, Worcester 6, Massachusetts.

*Trade-Mark Reg. U. S. Pat. Off. and Foreign Countries

To Economize, Modernize with NEW

NORTON

GRINDERS and LAPPERS

Making better products . . . to make your products better

NORTON PRODUCTS Abrasives • Grinding Wheels • Grinding Machines • Refractories • Electrochemicals — **BEHR-MANNING DIVISION** Coated Abrasives • Sharpening Stones • Pressure-Sensitive Tapes

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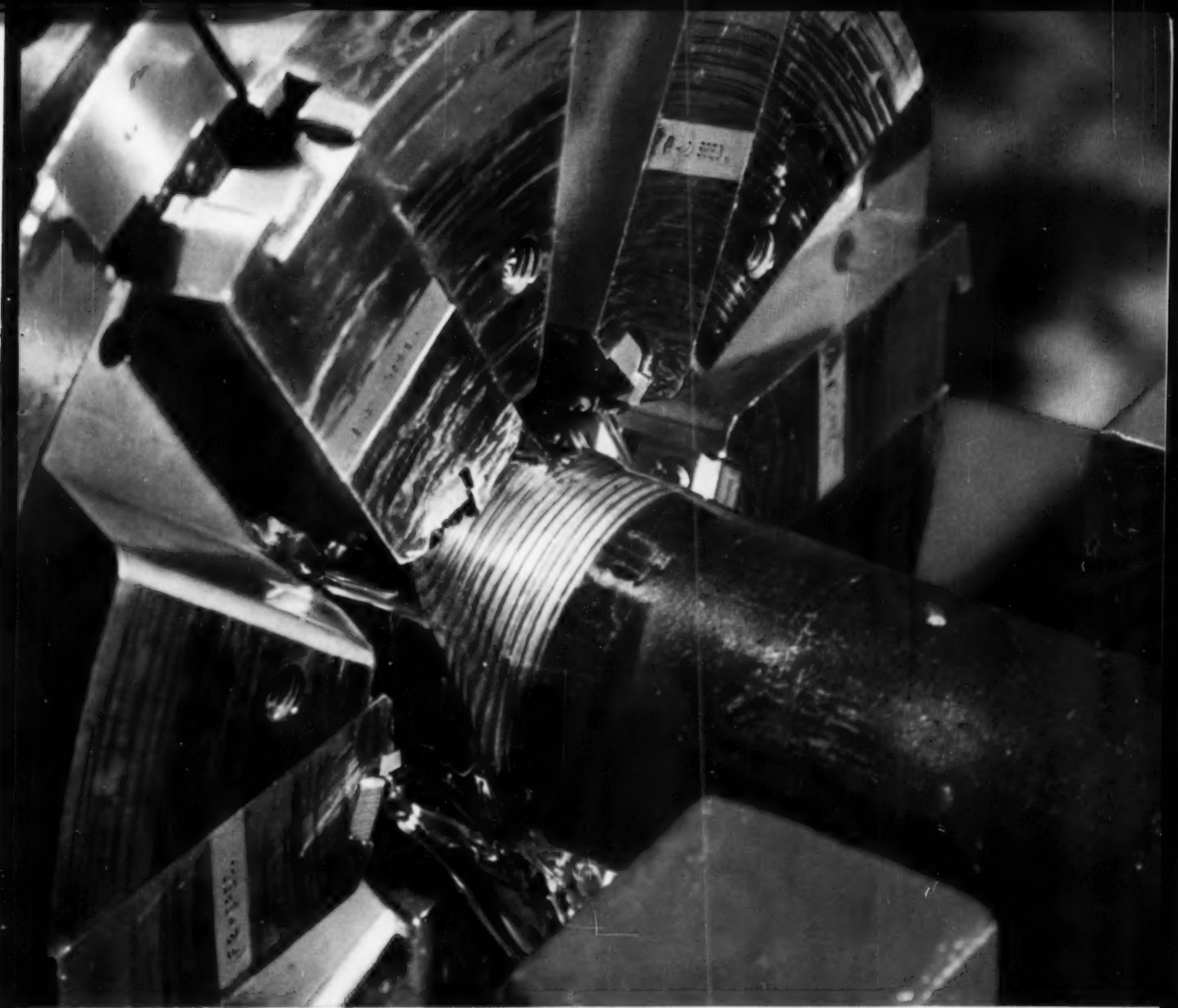

This is just one of the many applications of Sunicut 85, which is one of a whole series of Sunicuts . . . all transparent.

SUNICUT 85 is a heavy-duty cutting oil that lets you see what you're doing

Transparent, fast-draining Sunicut® 85 leaves the workpiece clear for inspection as you go.

Especially designed for use on high-alloy steels, Sunicut 85 is ideal for heavy-duty work on automatic screw machines and production form grinders. It's a natural for pipe threading and similar heavy-duty operations requiring frequent and close inspection.

Easy pumping, fast metal-wetting, and excellent extreme-pressure lubrication are other advantages of Sunicut that lead to production economy for you.

Ask your Sunoco representative about saving money with Sunicut, or write to Dept. I-10.

Industrial Products Department

SUN OIL COMPANY, Phila. 3, Pa.

SUNOCO

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You can have a free copy of our 60-page catalog by asking for it. Details over 2000 stock precision and commercial die sets—plus accessories.

2895 WEST GRAND BOULEVARD • DETROIT 2, MICH.

Offices in Principal Industrial Centers

SPOT NEWS...

- **High-energy-rate machine tool for metal forming** has been developed by Convair from its work with the shock simulator (*AM*—Apr 23 '56, p124). The pneumatic machine, called Dynapak, develops velocities to 500 fps and pressures to 250,000 psi. Same machine is said to be adaptable for extrusion, forging, forming, compacting, shearing or blanking.
- **Ford appears to have abandoned the idea of using front-wheel drive** for its forthcoming small car. The first series, to appear in the fall of 1959, will feature an overhead-valve, six-cylinder engine with conventional drive. Many body parts will be made from tooling salvaged from the 1955-57 Thunderbird programs—although the car will hold four passengers.
- **New standards for solid-carbide end mills, reamers and drills** have been developed by the Solid Carbide Tool Institute, 1015 Chestnut St, Philadelphia, in conjunction with the Metal Cutting Tool Institute.
- **Some 15 metalworking companies have adopted Ford's "building block" concept** of unitized-design machine tools. Among them: American Motors, Cummins Engine Co, General Motors, International Harvester, White Motor Co, Vickers Inc, Dana Corp, and International Buiness Machines.
- **Explosives are being machined by remote control and closed-circuit television** to great accuracy on semi-automatic "air gage tracer" engine lathes. Tolerance is 0.0005 in. as to overall accuracy. Start, stop, reverse and feed controls are remote. Rate of rotation can be changed once during operation.
- **Shirt-pocket, electronic paging sets, each with its own frequency,** keep things moving at Ford's new Lorain, Ohio, assembly plant. Caller reaches an executive who is not in his office by calling the plant telephone operator, who flips a switch on a coding machine. This makes a beeping sound in the executive's set. When he hears it, he phones the operator.
- **State of Maryland has had to refund $1.5 million in sales taxes** collected from defense industries that purchased machine tools and other equipment to fill out-of-state and federal government contracts.
- **Thirteen cutting and performance tests have been completed** on machine tool and numerical control systems by Air Materiel Command. Typical are two tests conducted by Cincinnati Milling: (1) a 4-x-14-ft-work-range, high-speed profiler produced test part tolerances averaging 15% of those allowable by specifications, and (2) a 12 x 45 ft skin mill averaged 39.6%. Tests included operation at maximum hp and maximum feed rate.
- **Italy's Alfa-Romeo and France's Renault** will build and sell each others' cars in an effort to counter expected competition from West German automakers in the forthcoming European Common Market, which starts January 1.
- **Chip pickup of HSS cutters during milling of magnetically chucked work** has been eliminated with a new chuck that uses cermet as its magnetic material. No secondary flux pattern is exhibited, so that the cutter doesn't become magnetized. An all-steel top plate may be used on the chuck, greatly increasing wear resistance, and improving surface flatness during reconditioning. The cermet chuck, developed in Europe, retains its magnetic power indefinitely, has a holding force on soft steel of 43 psi sliding, and 128 psi pull.

Spot index to major News stories...

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"Easy Accuracy"

That's what one Big Cleveland Gage Maker says about

ABRASIVE *six eighteen*

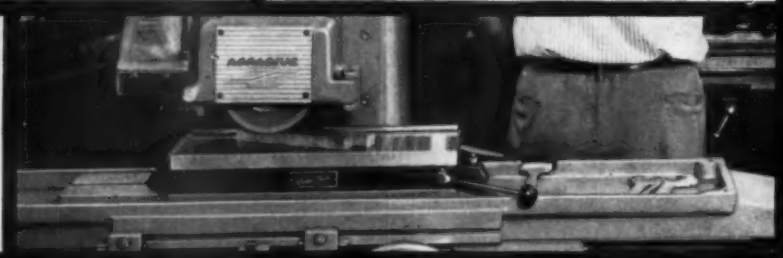
Hand Feed

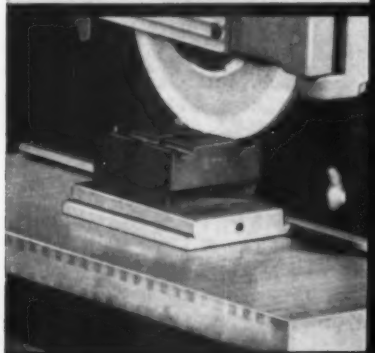
Precision

Surface Grinders

"Our new 618's", reports Bob Pringle, General Manager of Winslow Manufacturing, Cleveland, "are what we've needed to help us stay on top as the **first name in precision control.**" With Abrasive's modern design and 'operator engineered' features, the story is the same in precision shops all over the country.

At Winslow, "the feature which most impressed our employees is the fast table travel. This makes it much easier to grind hardened material." And well it should! The 618 rides smoothly on precision anti-friction rollers. It is actuated by a smooth cable and drum drive. You get 6" of table movement with each turn of the 8" handwheel .





Bob Pringle goes on to report, "we have used the machine primarily for gage work and find that the finish is very good. It's excellent for side grinding, too." Heavy, rugged, deeply-ribbed construction plus the advantages in Abrasive's motorized spindle and wheelhead assembly make high finishes easy.

Precision and efficiency are vital at Winslow, and they found "the good repeatability of the 618 dial settings to be of special advantage." All operators appreciate the comfortable, balanced feel of the smooth recessed handwheels, available either right or left-handed. They like the comfort and convenience of the controls all located on the same waist-high plane.

It makes good sense for you, too, to look into the many profit-producing advantages of the new Abrasive 618's. Without obligation our colorful eight-page tell-all brochure is yours. **Write for it, today!**

ABRASIVE MACHINE TOOL COMPANY

Dexter Road
East Providence 14, Rhode Island

WASHINGTON...

Defense strategy changes nixed . . .

The administration has thrown cold water on proposals from the Army and other sources (including some U S diplomats) for a major change in this country's military strategy.

The Army, some State Department officials, and others have been arguing strenuously in top-level Washington councils for a new emphasis on preparedness for limited warfare—meaning a substantial hike in spending for troop carrier planes, assault transport vessels, tanks, tactical missiles, small arms, and other so-called conventional equipment. Initial proposals called for a doubling of Army hard goods expenditures, now running at $1.3 billion a year.

The proponents have pointed to the crises in Lebanon and the Formosa Straits as increased evidence that this country is more seriously threatened by future local limited wars—"brushfire" conflicts"— than by a general nuclear war. They argue that recent defense budgets have put too much stress on preparedness for the big war—with the heaviest spending earmarked for the Strategic Air Command —and have downgraded U S capabilities for fighting a limited war.

The administration's latest thinking on the controversial issue of limited war vs general war was aired two weeks ago in a major policy talk by the Joint Chiefs of Staff chairman, Gen Twining.

Said Twining: It's "risky" to assume that the threat of one kind of war over another is more serious. Our defense forces are now geared to fight both kinds of wars and will continue to stress "flexible" capabilities.

Twining went out of his way to put the administration's plans into perspective: The Army will not be allowed to boost its spending substantially for armor and other tactical equipment: the Air Force will not step up procurement of troop carrier planes.

Instead, the Army will be (1) limited to its current volume of hardware procurement, (2) pressured out of the space rocket field, and (3) forced to use its available dollars for improving mobility of its tanks and battlefield missiles. All of which does not add up to the big policy switch Army advocates have been demanding.

Army vs NASA . . .

The Army is taking a beating on still another front. The National Aeronautics & Space Administration, the new civilian agency, is fighting to take over management of the $57.5 million laboratories of the Army Ballistic Missile agency at Huntsville, Ala, and the $23 million jet propulsion labs at Pasadena, Calif, operated for the Army by Cal Tech. Odds are NASA will have its way.

NASA's new head, Case Institute President T Keith Glennan, has moved quickly to establish unquestioned civilian control over space research. He has already taken charge of the service-controlled space projects not tied in with specific weapon system development—the Lunar Probe Program, the IGY earth satellites, and assorted secret projects. For the most part, the services have stayed on at the operating level only as long as their own hardware and facilities have been essential to the program.

Now Glennan has put in his bid to take over the facilities—and it's the Army which has them. The Army is resisting, argues that loss of its key scientists would slow down development of its tactical and air defense missiles.

Most of the scientists and engineers involved—and most ABMA and JPL contractors—also oppose the transfer.

Defense budget woes . . .

Despite Washington's new emphasis to hold the line of military expenditures (see Aircraft & Missiles, p75), there are growing signs that the Pentagon's budget is pushing beyond the administration's spending targets.

Pentagon budget officials appear to confirm this outlook by their refusal to reveal quarterly military spending estimates for the next nine months. They say the estimates must first get White House clearance—an unusual departure from past policy. The first-quarter figure on military expenditures, $9.9 billion, does run well under the $40.8 billion spending estimated for by 1959 as a whole. But the July-September quarter is traditionally a low period for military outlays.

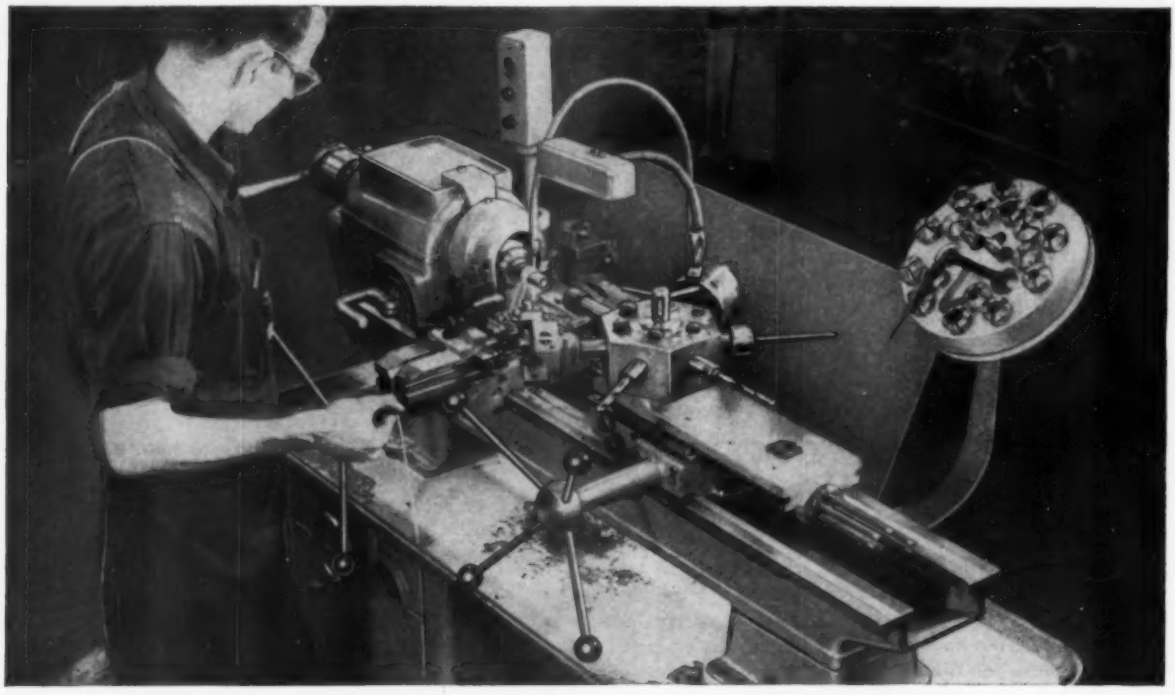
Deputy Secretary Quarles confirmed that the preliminary estimate—or target—for defense spending in fiscal 1960, starting next July 1, is currently set at $42 billion, as *American Machinist* has reported previously.

But Quarles also said—in an obvious slip of the tongue—that the defense spending boost "could be held within 10%" He later changed this to 5%. All of which raises the strong possibility of a rise well over $2 billion in defense spending next year—instead of the present forecast of $1.2 billion.

At least 1 to 2% of the rise can be marked off as inflationary cost increases, Quarles said.

ROCKWELL-BUILT

NEW DELTA HAND SCREW MACHINE



Cuts production costs

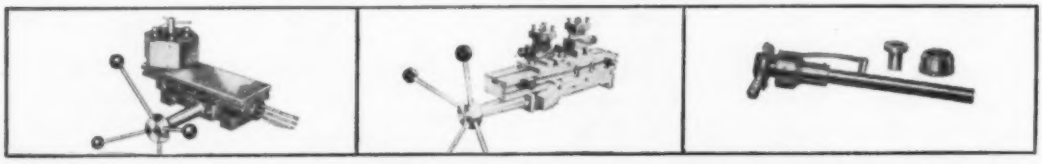
on multiple machining jobs

Here is a precision machine engineered to fill the wide gap between standard engine lathes and expensive automatic screw machines . . . and at lower cost than *any* comparable machine!

Bed turret, double tool post cross slide and lever type collet closer are included as *standard equipment.* But you don't pay for lathe components you don't use—the carriage, quick change gear box, gear train, gear rack and tail stock.

Delta Quality Features such as perfected Variable Speed Drive and unique Drive Selector offer greater flexibility, assure proper speed and power for each operation. In addition you get the hefty Delta head stock with matched "V" belts in the final drive to the spindle.

Convert Your Delta 11" Lathe to a Hand Screw Machine by adding the three accessories pictured below and removing the carriage and tail stock assemblies. This gives you the double versatility of a ram-type turret lathe for production operations, and a standard engine lathe for toolroom, maintenance and experimental work.



BED TURRET has a self-indexing, six-station head built for heavy duty. It offers a full 4½" tool clearance over the ram and a 7½" maximum working stroke.

DOUBLE TOOL POST CROSS SLIDE features exclusive, new *pilot wheel feed* for greater safety, speed and convenience. Provides full 8" travel, extra clearance for tools held in bed turret.

LEVER TYPE COLLET CLOSER takes bar stock up to 1⅛" diameter. Used with all 5-C collets. Bars can be fed, chucked, machined and released without stopping the spindle.

See the Hand Screw Machine at your nearest Delta Dealer . . . he's listed under "TOOLS" in the Yellow Pages.

GET ALL THE FACTS on Delta's new Hand Screw Machine, full line of accessories and the complete line of metalworking lathes. Write for FREE Delta Industrial Catalog: Rockwell Manufacturing Co., Delta Power Tool Div., 618L N. Lexington Ave., Pgh. 8, Pa.

DELTA POWER TOOLS

another fine product by

ROCKWELL

DETROIT... TRENDS

Autos are moving . . .

Industry leaders of late have consistently predicted domestic sales of 5.5-million 1959 models. This figure included an estimated 400,000 imports, and may happily be pessimistic by just that amount. It looks from here like nearly a 6-million car year in the offing.

Because labor strife crippled production through mid-October, the only indicator is dealer orders. Buick reports more than 100,000 of these on its books a month after announcement, including the 26,000 cars manufactured before strikes shut down the lines.

American Motors President George Romney is saying that 1959 model Rambler production may double 1958's record performance. The company has $203 million in dealer orders. Production has been boosted for the fourth time in the new model run—this time by 13%.

At this rate, 100,000 units will be built by December's end. Romney hints that expansion of car building facilities is in the wind.

Pontiac logged 250% more "firm" customer orders for its first three days of sales for a total of 20,500 cars. Ford Division claims a whopping $1 billion in dealer orders, with M-E-L Division adding $143 million to that total. Mercury, Edsel, and Lincoln assembly plants are currently working overtime.

A consensus of telegrams sent in by Dodge Dealers shows first day sales up 100%. Struggling Studebaker, totally dependent for its survival upon the sales performance of its new, compact Lark, cheerfully announces dealer orders already amounting to a little over half of the entire 1958 model run. Even Willys, which no longer changes models annually, found its September retail sales at the highest level since 'way back in December 1956.

Aluminum gains ground . . .

Reynolds Aluminum Co, happy possessor of 10-year contracts to supply large quantities of molten metal to General Motors and Ford, is in public cautiously optimistic about continued increases in automotive aluminum consumption.

VP Abram D Reynolds recently noted that average per-car usage reached 52 lb in 1958, a 400% increase in just the past few years. Fellow VP John Blomquist went on to predict an average of 200 lb by 1970.

Actually, the Reynolds officials as a matter of prudence were using published figures from auto industry sources. Privately, aluminum people think these to be highly pessimistic, because proprietary developments of the near future cannot be included.

One ill-kept secret of this sort is the fact that Chevrolet's forthcoming "smaller" car will use an all-aluminum engine. Another (and more important consumption-wise) is the near certainty that Ford will be the first to introduce standard-sized, liquid-cooled aluminum V-8 engines in its 1961 models. GM should follow shortly thereafter.

The impact on aluminum reducers will obviously be staggering, but Reynolds at least is prepared to meet it. Its total virgin capacity is 700,000 tons annually. The company has molten metal plants adjacent to GM and Ford facilities at Arkadelphia and Jones Mills in Arkansas; Massena, N Y; and in Sheffield, Ala. Massena alone could produce enough molt for 600,000 V-8 engine blocks annually, but it won't because it is currently slated to feed material for the horizontally-opposed, air-cooled six in Chevrolet's small car.

Other aluminum developments in the offing include an experimental integral wheel and brake drum designed by Kelsey-Hayes, and aluminum auto radiators. The wheel, now under test by major automakers, would save 80 lb when installed in sets, and its braking ability is claimed to be superior.

Off the cuff, Abram Reynolds admits that the biggest problem is the auto industry's tremendous investment in iron foundries. But he can cite a recent statement by GM's Darl F Caris before the Gray Iron Founders' Society that aluminum for engines is now competitive with iron from a cost standpoint.

Turbines nearly here . . .

During the recent Motorama, GM President John F Gordon dropped the news that Allison Division is planning a production and selling program for its Whirlfire gas turbine engine, which is similar to the latest design in the Firebird III show car. The engine would be available for installation in military equipment, construction machinery, and possibly heavy-duty trucks and buses. Production is expected within a year, but Gordon emphasized that turbines for passenger cars "are at least five years away."

DRILLS or TAPS

6 *different diameters in* 22 *SECONDS!*

The new BURGMASTER

Bench Model Turret Drill

- Power indexes between stations
- Individual speeds on each spindle
- 2 complete speed ranges
- ¼" maximum capacity
- Protective overload slip clutches on spindle drive and indexing mechanisms

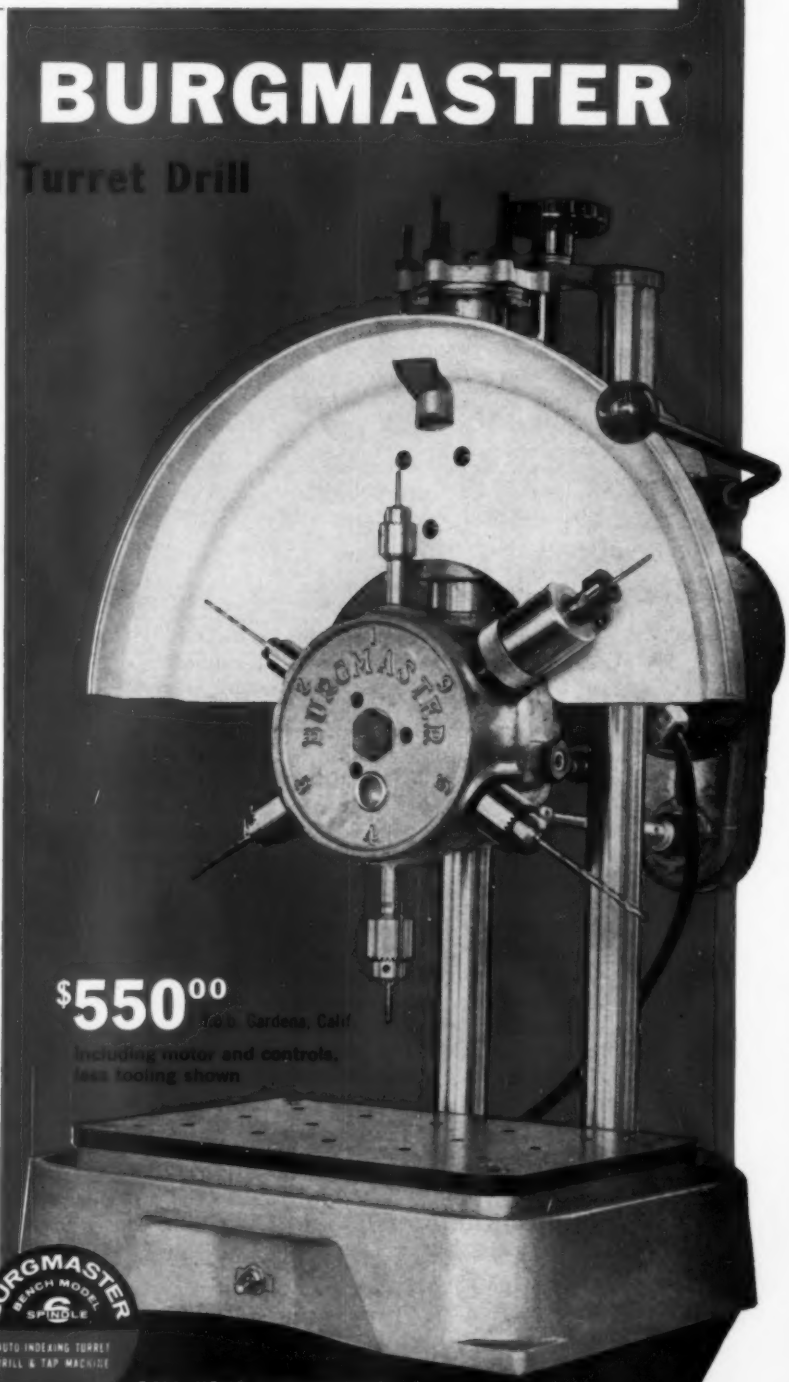
Here's the newest, most efficient drill press available for making small holes, faster! A Burgmaster *finishes* the job in the time normally required *to move work from spindle to spindle*—without machining! No lost motion, no operator fatigue...the powerful Burgmaster Bench Model drills up to ¼" diameters in steel; taps, counterbores, countersinks, reams, spot-faces!

INSTANTLY INDEXES ITSELF to each new station for a change of hole diameter or tooling. Duplicate operations can be performed with any spindle *without indexing.*

INDIVIDUAL SPINDLE SPEEDS—Each spindle *has its own speed* for greatest drilling efficiency with different tool sizes and without changing belts, gears, etc. Two spindle speed ranges cover 95% of all machining requirements with tools up to ¼" in diameter. Spindles can be located in any station sequence for maximum production efficiency.

For greater output, for lower cost per hole get the new BURGMASTER Bench Model!

SPECIFICATIONS: Maximum capacity, ¼" in steel; overall dimensions, height 31½"; width, 17"; depth 20"; motor, ¾ hp; chuck to base clearance, 10¼"; maximum spindle travel, 2⅞"; center of spindle to column clearance, 5⅜"; geared head permits each spindle to operate at a predetermined speed between 350-6200 rpm.



$550.00 f.o.b. Gardena, Calif.
Including motor and controls, less tooling shown

BURGMASTER BENCH MODEL 6 SPINDLE AUTO INDEXING TURRET DRILL & TAP MACHINE

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AIRCRAFT and MISSILES...

TRENDS

Axe for duplicate projects?

The aircraft and missile industry is once more under the gun of a Pentagon economy drive. Defense Department budget-cutters are driving to weed out competing or rival production projects, so-called "back-up" research and development projects which have been run as extra insurance for critical programs, and other duplicating hard goods expenditures.

Behind the push is the Eisenhower administration's new campaign to trim the overwhelming federal budget deficit.

The policy is to keep military expenditures for fiscal 1960, starting next July 1, to about $42 billion. This is roughly $1.2 billion over current spending. While this is a big budget increase, it nevertheless falls far short of the sums needed to finance existing defense production plans. The crash projects whipped together during the immediate post-Sputnik furore, the Lebanon and Formosa Straits crises, plus growing inflation in military production costs, and related factors have all combined to push next year's defense budget requirements well over the new $42-billion spending ceiling.

So just to hold outlays down to a $1-billion-or-so increase in fiscal 1960, the military services are being forced to trim production plans. Much of the savings, Pentagon budget men believe, can be made by screening rival aircraft and missile development and production projects.

Outlook on production plans . . .

The outlook is for wide-ranging cutbacks in projects which are geared for the same operational missions—that is rival missiles, planes, etc. Some programs will be killed outright. The scope of others will be reduced. The big goal is to prevent two or more rival research projects from moving too far into the advanced hardware stage. But in cases where substantial production is already under way rates will be reduced.

The new stress on reducing duplication, however, will be tempered by the opinion of many of the Pentagon's top-level scientific consultants that competition—even duplication—of R&D effort is not necessarily bad. Indeed, they tell the Pentagon, it breeds more rapid results.

Projects under scrutiny . . .

Here's a rundown of outstanding projects in which duplication of effort can be argued and which shape up as logical prospects for the closest scrutiny:

- **Chance Vought's F8U-3 vs McDonnell's F4H**—Both Naval all-weather fighter-interceptor planes are being flight tested. Mission and performance are essentially the same but the configurations differ. Another likely candidate for cutback considerations in the interceptor aircraft field: the Air Force's McDonnell F-101B.
- **Thor vs Jupiter IRBMs**—Competing production of these missiles will end shortly. Thor's output is about double the Jupiter rate. Odds are that Thor production will be boosted some while Jupiter output will continue only long enough to equip the two or three squadrons now planned for Italy, Turkey, and perhaps France.
- **Atlas vs Titan IRBMs**—Atlas development will continue on a crash basis, and will eventually get into much heavier-volume production. Titan, which runs two years behind in time schedules and represents a more venturesome approach, will most likely remain on a more relaxed schedule. Prospects are it will be brought into operation production in very limited numbers, will serve as a major launching rocket for space vehicles.
- **Nike Hercules vs Bomarc**—Both missiles will be kept in quantity production, but unit output of each will be well under what the Army (for Nike Hercules) and Air Force (for Bomarc) initially planned. Bomarc got a hefty shot in the arm from Canada's new decision to buy the missile for air defense.

More support for small subs...

Congress has taken another swipe at the Pentagon's volume of defense contracts with small business. In a new report on small business participation in the missile program, a Senate Subcommittee headed by Senator Smathers (D, Fla) calls for a revision of Pentagon policies that bar smaller firms from defense business.

During the first 11 months of fiscal 1958, which ended June 30, small firms were awarded 3.2% of military research and development prime contracts, the Subcommittee reports. This is down from 4.3% of dollar volume in the preceding year.

In the same period, production prime contract awards were down from 18.9% of the total to only 16.2%.

Says the Subcommittee: The Pentagon's guided missile director William Holaday "displayed a disappointing lack of appreciation for both the contributions made to our defense effort by smaller firms in the past and the substantial role that Congress has determined they shall play in all of our military programs."

Introducing the NEW MODEL 1-A SEVER-ALL Machine... CUTS AT 3 to 6 SECONDS PER SQUARE INCH—ECONOMICALLY

MANY EXTRA FEATURES AT A DELIVERED COST UNDER $500

You get the cut quality and capacity of machines nearly three times as expensive when you use the new Model 1-A SEVER-ALL oscillating dry abrasive cut-off machine. Available from your distributor's stock. Here's why the #1-A SEVER-ALL is ideal for industrial and machine shop operations:

BIG CAPACITY • Up to 2" square solids, 3½" O. D. pipe and tubing, 3" angle iron, and 4" channels . . . of cold rolled, stainless, and alloyed steel; cast iron; and nonferrous metals. Wheel oscillation, an exclusive feature in this price range, provides this *above-average* capacity.

SPEED • Cuts a 2" x 2" hardened steel bar in 16 seconds . . . other shapes and sizes at 3 to 6 seconds per square inch.

QUALITY • Clean, smooth cuts, even on large sections, because wheel oscillation provides cooler cutting.

ECONOMY • In addition to low initial cost, the Model 1-A SEVER-ALL is inexpensive to operate . . . occupies minimum floor space . . . requires little or no set-up time . . . eliminates annealing costs . . . gives more cuts per wheel because of oscillation.

SIMPLICITY • Just two SEVER-ALL cutting wheel specifications will do *all* your SEVER-ALL cutting jobs. A positive, screw-type vise holds all regular shapes, and an adjustable work stop provides speed and accuracy.

ANGLE CUTS • Optional accessory permits cutting angles up to 45° in either direction.

NEW SEVER-ALL AVAILABLE FROM DISTRIBUTORS

Very likely your own distributor already stocks the Model 1-A SEVER-ALL machine and wheels. If not, let us know, and we'll give you the name of your nearest SEVER-ALL distributor. Also, we'll be glad to send you complete details on this new machine. Just ask for **Bulletin DH-106.**

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MACHINE TOOLS...

Inquiries foreshadow sales gains...

Confidence in a pickup in new orders in the near future was expressed by distributors and builders attending the annual meeting of the American Machine Tool Distributors' Association at Boston. They cited the volume and vigor of recent inquiries.

Actual bookings this month have been better than in September, a number of companies reported.

Net new orders for cutting-type machine tools showed only a slight gain in September. The increase would have been greater except for the fact that foreign orders dwindled to a low point.

Some 11,000 surplus government machines were disposed of in fiscal '58, and about 20,000 will be offered in fiscal '59, George Merryweather, vice president Motch & Merryweather Machinery Co, told AMTDA members at Boston.

Political pricing by Soviet bloc...

"Political exporting and pricing" by iron curtain countries are stirring trouble in world machine tool markets, Ralph J Kraut, president Giddings & Lewis Machine Tool Co, told AMTDA. Example: Skoda bid 30,000 pounds sterling on a large horizontal boring mill for a western European user, whereas a western European builder asked 60,000 pounds sterling. Similar-type U S machine is priced around 100,000 pounds sterling.

Russia is exporting around 20% of its 125,000 machine tools produced each year, Mr Kraut said. He estimated that in 1957 machine tool builders of western Europe and the United Kingdom outproduced the United States. Today, western Europe has more than 1000 machine tool builders.

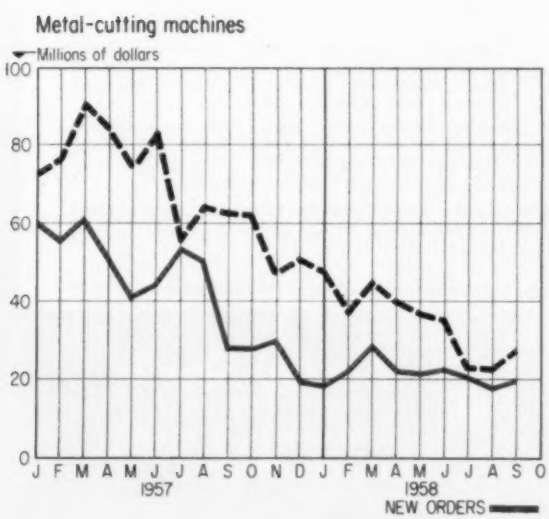
Meeting in Brussels...

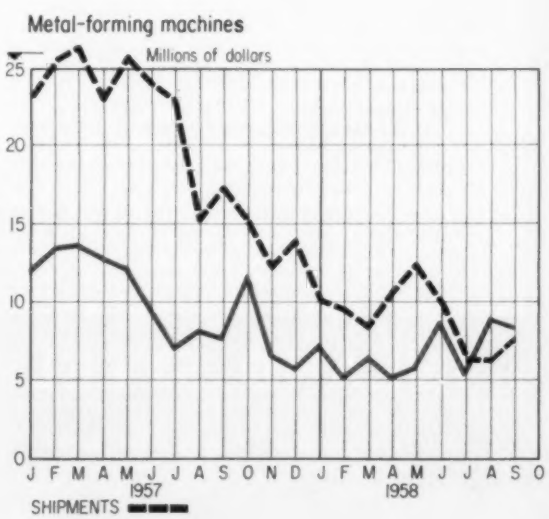
An informal meeting was held in Brussels recently between a committee representing the National Machine Tool Builders' Association and the European Committee for Cooperation of the Machine Tool Industries. U S committee consisted of Alfred V Bodine, NMTBA president; Ralph J Kraut, first vice president; Ludlow King, executive vice president; and M A Hollengreen, past presdient NMTBA. Count Motta of Italy, president of the European Committee, presided. The meeting was the result of an invitation extended by the European Committee to NMTBA. Meetings between the two groups probably will be continued on an annual basis.

Reissue of Bulletin F...

Bulletin F of the Internal Revenue Service is about to be reissued without any important shortening of the useful lives listed for production equipment, according to reliable Washington sources. Buyer who can make out a good case for speedy writeoffs won't have to follow it. Internal Revenue people intend to say that Bulletin F should not be taken by their agents as the bible.

Burnham Finney EDITOR





facts about LEDLOY* FREE-MACHINING STEELS

Considerations in the Use of Inland Ledloy Steels to Reduce Machining Costs*

"Most metalworking plants strive to trim costs as well as metal—so long as quality standards can be maintained. But it takes a lot of ingenuity and 'know how' to neatly balance all three factors: costs, machining efficiency and quality."**

INLAND LEDLOY free-machining steels should be thoroughly investigated in efforts to achieve this end.

You should consider LEDLOY STEELS . . .
. . . if you are presently producing a product from regular carbon steel that requires machining.

The Inland process of adding lead to any grade of steel phenomenally improves machinability without materially affecting other properties. The normally specified physical properties required for a particular application are retained in the equivalent Ledloy Steels. The only characteristic that is affected, and to a marked degree, is the steel's machinability.

Forgings made from Ledloy, for example, can be heat treated and forged in exactly the same manner as similar non-leaded grades of open hearth steels, yet will machine up to 50% faster. A switch to Ledloy for forgings will also result in a superior finish on the machined part.

Whatever grade of steel you are currently using for your products, if machining is an important part of your fabricating process, a change to a similar Ledloy grade can cut your total machining costs appreciably.

You should consider LEDLOY STEELS . . .
. . . if you are presently using a non-leaded machine stock.

Ledloy Grade A, the most widely used leaded steel grade, machines from 25% to 55% faster than regular free-machining steels and yet retains all the desirable characteristics of the non-leaded grade of comparable base analysis.

The precise quality control measures used by Inland in the production of Ledloy Steels result in a surface that is superior to similar non-leaded machining steels. Tolerance control is easier and the completed part has a finer, smoother finish.

You should consider LEDLOY STEELS . . .
. . . if you are presently machining parts from free-machining brass.

Ledloy Grade B, a steel that is somewhat more costly than Grade A, has been used successfully as a substitute for free-machining brass in a number of applications. The basic material cost of Ledloy Grade B is only about half as expensive as brass, yet approaches brass in machinability. However, the higher scrap return on brass, over leaded steels, must be considered in estimating overall cost savings.

If machinability rather than corrosion resistance or non-magnetic properties is the primary reason for the use of brass in a given application, Ledloy Grade B should be seriously considered for its cost-saving advantages. Because leaded steels weigh less than brass, they yield more parts per pound. Then, too, the greater strength of leaded steels often makes possible the redesigning of a machined part to obtain material savings with no loss of strength.

GENERAL CONSIDERATIONS

1. **Amount of Machining.** Ledloy Steels were developed by Inland to provide a more efficient machining steel. The advantages of their use are in direct proportion to the amount of machining performed on parts made from them. The greater the amount of machining, the greater the possible savings using Inland Ledloy Steels.
2. **Capacity of Equipment.** If your present equipment is not being run at full speeds or feeds, considerable savings can result by using Ledloy grades and taking advantage of their much greater machining rate. Increased speeds and feeds are possible, and with reduced tool wear.
3. **Surface Finish.** If finish is important in the machined product, Ledloy Steels can be beneficial. The superior finish resulting from the use of Ledloy Steels has made possible the elimination or reduction of costly additional processing in a number of applications.
4. **Tool Life.** If the machining operation wears tools excessively, necessitating frequent changes, or if tool cost is relatively high, Ledloy Steels can effect significant savings. Because of its lower friction component, plus the fact that Ledloy provides better chip formation, tool-edge build-up is cut to a minimum when machining Ledloy steels. Ledloy Steels actually lubricate the tool face, reducing heat generated and minimizing tool wear. This means greater production per tool change and decreased costs.

Many grades available—Inland Ledloy free-machining steels are available in a wide range of standard carbon and alloy grades in bar form. Ledloy free-machining plates are also produced.

If your product requires machining, it will pay you to get all the details on Inland Ledloy . . . the original leaded steels. Ask your cold-drawer about them today, or write Inland Steel Company, 30 West Monroe Street, Chicago 3, Illinois, for the interesting booklet, "Properties of Inland Ledloy Steels."

***Iron Age Special Feature #10, July 25, 1957. "How to Get More for Your Metalworking Dollar" (Machining Ferrous Metals)*

INLAND STEEL

Sales Offices: Chicago · Milwaukee · St. Paul · Davenport
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INLAND

Ledloy Steels
the world's most machinable
*Reg. Trade Mark

MATERIALS... TRENDS

High-strength, low-carbon steel...

Columbium is one of the principal alloying elements in a significant new series of fine-grained, mild-carbon steels of unusually high strength, toughness and weldability. The new alloys were developed by the Great Lakes Steel Corp, a subsidiary of the National Steel Corp; are called GLX-W steels.

Outstanding mechanical properties plus lowered material and manufacturing costs and simplified manufacturing requirements are expected to produce a wide range of applications. Industrial interest in the new alloys bears this out.

Markets for columbium are materially enlarged as a result of this new alloy, according to Marx Hirsch, president of Molybdenum Corp of America, which supplied the alloying ingredient. GLX-W steels add substantial support to the recent suggestions by research groups that columbium has metallurgical properties deserving of special attention.

Metal-like plastic...

Free-machining plastic bar and plate stock, called Ryertex-Omicron PVC, is said to have the machining characteristics of brass. For use where resistance to corrosion is a prime factor, the material was shown at the National Metal Exposition in Cleveland by Ryerson.

Plasma heat...

Plasma heat sources (see p87) will find wide application for coating, cutting and casting many materials. Developments are moving rapidly as a number of companies shift from research and development to commercial equipment. Licensing and patent arrangements, and problems, are rapidly developing.

Some time ago Metallizing Engineering Co, Westbury, NY, contracted with Thermal Dynamics Corp, Hanover, NH, to develop plasma equipment. Now, with a commercial product line, Metallizing Engineering Co has retained exclusive rights to vapor coating only. It has formed a subsidiary, Plasma-Flame Corp, to handle other applications and has given a license to sell research and development equipment to Thermal Dynamics Corp.

Fastener firm expands...

Research and development facilities have been greatly increased as one result of Allen Manufacturing Company's move to its new plant in Bloomfield, Conn. Now the company has advanced time schedules on many new products, as well as improvements on existing products. Emphasis on R and D, plus the need for closer quality control, all of which call for more equipment and space than heretofore, were major factors in the decision to move.

Lightweight auto radiator...

Over 7000 cars are currently roadtesting a lightweight aluminum-finned automobile radiator. Several radiator manufacturers are interested in producing the device, developed after 12 years of research by the Aluminum Company of America.

Weighing 20% less than copper-finned radiators, the unit still uses copper tubes to conduct the coolant. Average installation requires four pounds of aluminum as against eight pounds of copper. Greater expense of fabricated aluminum alloy is offset by cost saving through lesser weight. Only minor changes in manufacturing procedures are required.

Navy heat problems...

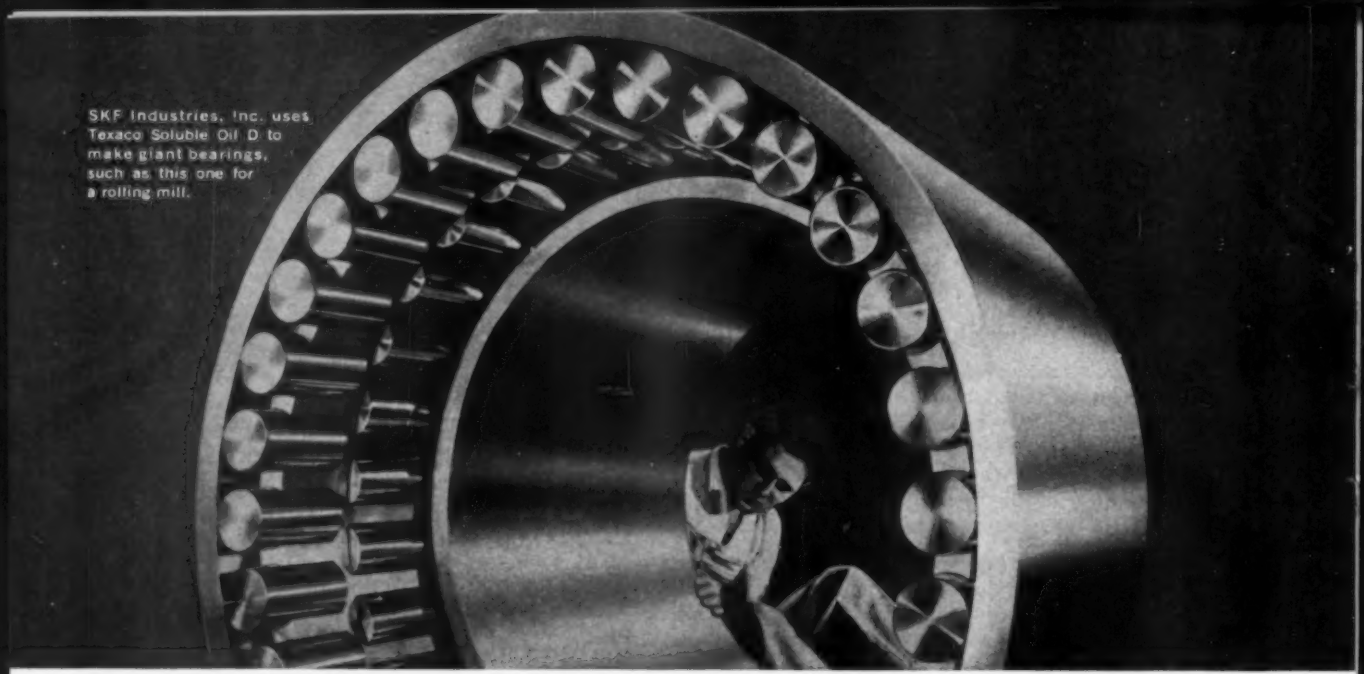
Reinforced plastic, including glass-filled and mineral-filled, have proved useful to the Navy at high temperatures where erosion is not significant, Admiral John T Hayward, vice chief of naval operations, revealed to the American Machine Tool Distributors Association. Work in ceramics has produced good results in many materials—boron phosphides, zirconium boride and tantalum carbide.

Navy now has metals coated with ceramics by flame spraying. Thin ceramic shells are being prepared by a new method (not revealed) other than flame spraying.

Magnesium reaches out...

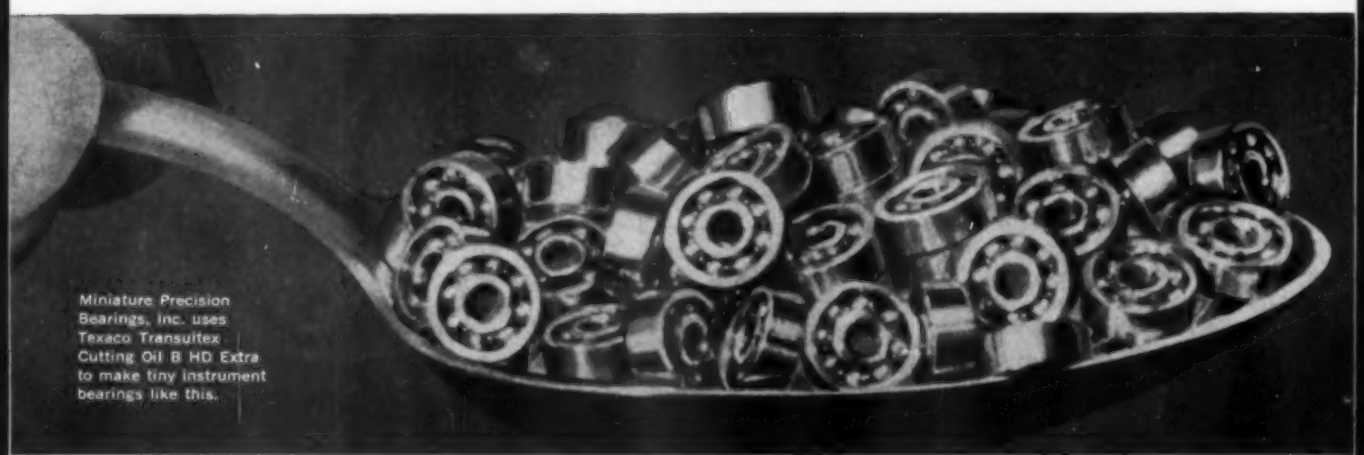
Seeking a crack at the US small-car engine, magnesium specialists are pointing out that the Volkswagen uses 36 pounds of magnesium in its engine. Major parts include crankcase, and transmission housing. Permanent-mold casting is the principal manufacturing technique although many small parts are made by diecasting.

Magnesium engine parts were among the more forward-looking ideas presented at the 14th Annual Convention of The Magnesium Association in Detroit. More than 400 executives, engineers, and others in the automotive, aircraft, electrical, and contemporary industries met to discuss better ways to use magnesium.



SKF Industries, Inc. uses Texaco Soluble Oil D to make giant bearings, such as this one for a rolling mill.

WHAT SIZE IS YOUR MACHINING PROBLEM?



Miniature Precision Bearings, Inc. uses Texaco Transuitex Cutting Oil B HD Extra to make tiny instrument bearings like this.

If you make anti-friction bearings of any size, you need grinding fluids that prevent rust and produce uniformly fine finishes. These fluids must also take into account the bearing material and the operating condition of your machines. They must have specific stability, cooling properties and ability to settle grinding dirt quickly. Otherwise your production drops and the number of rejects rises.

The makers of the small and large bearings shown above get fine bearing finishes and high production by using Texaco. There is a complete line of Texaco Cutting, Grinding and Soluble Oils to help improve machining on every job.

Take this tip. Use Texaco Cutting, Grinding and Soluble Oils—they'll help you produce faster, better and at lower cost, whether your product is the largest or the smallest.

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WHAT'S AHEAD... in Metalworking

TRENDS

Consumer hard goods output paces recovery...

Automobiles and appliances appear destined to lead an upturn in metalworking production. The upturn will be felt most in consumer goods. Orders for capital goods still are at low ebb, though prospects have improved. Output of industrial machinery hence will be relatively slow for the next few months.

Automakers today are more optimistic than they have been in several years. On the basis of dealer orders for '59 models, which have been spectacular in the first few weeks after introduction, industry predictions of 1959 output are being revised sharply upward (see p73).

Appliances, despite a slow start early this year, now give every indication that they will equal and probably surpass 1957 levels. Inventories of long-overstocked dealers are dropping fast, and manufacturers are adding shifts and increasing production to fill gaps in dealers' stocks. Moving well are washers, clothes dryers, and refrigerators. Range, water heater, television and radio set production is slower to improve.

Farm equipment manufacture, which has had a production history closely paralleling that of appliance output over the last few years, is also coming up very fast. The fourth quarter has been particularly good, after a slow start this year. One firm says September was its best month in 10 years, another claims that it will chalk up a 16% sales increase over 1957, for an all-time record. This high level of sales and output is expected to continue at least through first half '59.

Steel production is reflecting the upturn in consumer goods output, rising more than 5 points in a single week. Production rates are now pegged in the neighborhood of 80% capacity.

Considering that automotive output is still being held back to some degree by unsettled local strikes, indications are that steel orders are coming in from many segments of metalworking.

The foundry industry, for the first time in many months, is optimistic over business prospects.

Steel castings, in particular, have shown a marked upturn since the industry hit bottom in July, but output is still a long way from what steel foundrymen consider desirable levels (80% of capacity).

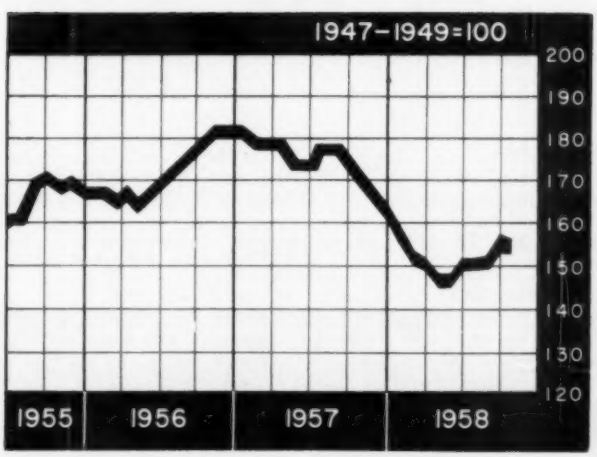
Gray iron founders expect to see their production pass the million-ton mark this month for the first time this year. A strong fourth quarter would bring 1958 production up 10.5-million tons, but this would still be 16% below last year, and would make 1958 the worst year for the industry since WWII.

Screw machine products industry's operating rate is still below 50% of rated capacity, and is running 25% behind the first nine months of 1957. So far no upturn is in sight.

Tool and die industry at last report showed a decline in early fall after improving month-by-month since February.

General job shops, too, are holding at about year-long levels. Those shops working on heavy equipment were late to feel the recession but, says one, "We're in the midst of it now." Backlogs are down to zero and orders are slow.

Cutting tool sales have been climbing slowly, but steadily for the last six weeks or so, and the rise is expected to continue through this month, then hold steady at least into January.



AMERICAN MACHINIST INDEX OF METALWORKING PRODUCTION

BASED ON MANHOURS WORKED IN THE FIVE COMPONENTS

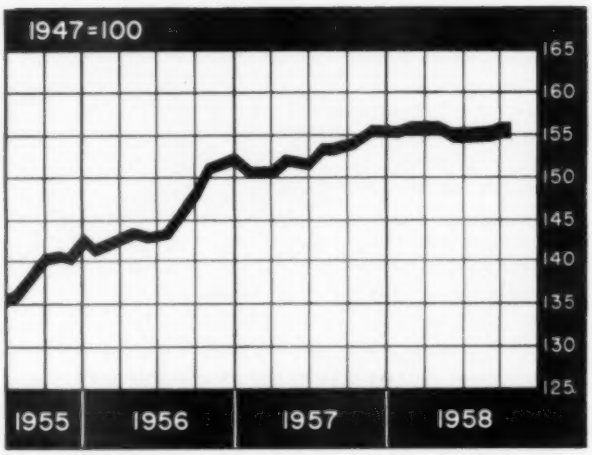
	OCT. Estimated	SEPT. Preliminary	AUG. Revised	SEPT. Year Ago
Total Index	**156**	**155**	**156**	**174**
Machinery	**129**	**126**	**151**	
Electrical Machinery	**184**	**188**	**207**	
Autos	**67**	**76**	**94**	
Other Transportation	**370**	**381**	**399**	
Other Metalworking	**140**	**137**	**147**	

TRENDS WHAT'S AHEAD... in Business

AMERICAN MACHINIST INDEX OF METALWORKING PRICES

	OCT Estimated	SEPT Preliminary	AUG Revised	SEPT Year Ago
Total Index	**155.8**	**155.8**	**155.8**	**153.9**
Metalworking Machinery	**180.7**	**180.8**	**180.4**	
Other Machinery exc Electrical	**166.2**	**165.9**	**163.9**	
Electrical Machinery	**159.1**	**159.1**	**157.0**	
Fabricated Metal Products	**146.1**	**146.2**	**144.5**	

155.8



Industrial production bounces back...

Industrial production, as measured by the Federal Reserve Board's index, will top 140 (1947-49=100) by year's end. The index level for September was 137. October will probably hit 139.

So far industrial output has recovered 11 points from the April low point, or more than half of the overall drop in output during the recession.

Output of minerals, especially crude oil, made the biggest gain during the current recovery.

Durable manufacturers have bounced back 10% from the bottom with steel leading the way. Nondurable goods production has increased 8% since its low point of March. However soft goods production has led the recovery—beginning its up-turn one month earlier then the other major components of the industrial production index. Textiles and paper were the two key industries which initiated the recovery. Right now, output of nondurable goods is at an all-time high.

While industrial production has been moving up at a very rapid pace, the total number of manhours worked in industry has not increased at anywhere near the same pace. This suggests that output per manhour or productivity is going up sharply, after several years of only small change in the rate of productivity gain.

The current rise in productivity rate is typical of what takes place in the early part of a recovery in business. During this period, the most efficient equipment is being operated and the most efficient labor force is at work.

All this adds up to a pretty good profits picture for the third and fourth quarters of this year. With increasing production rates and increasing productivity, accompanied by little change in materials and labor costs, profits statements for most companies will be glowing.

The first few third quarter reports released indicate that this is the case.

WEEKLY BUSINESS INDICATORS	Latest Week	Preceding Week	Year Ago
Business Week Index of Activity (1947-1949=100)*	135.9	135.1	141.5
Steel ingot operation (thousands of tons)	2,018	2,003	2,052
Electric power output (million Kilowatt hours)	12,048	12,067	11,684
Production of automobiles and trucks	61,642	51,964	96,341
Engineering construction awards (Eng. News-Record—millions)	$251.4	$248.1	$359.6

MONTHLY BUSINESS INDICATORS	Latest Month	Preceding Month	Year Ago
Index of industrial production (1947-1949=100)*	137	136	144
Index of durable manufactures production (1947-1949=100)*	139	138	146
Durable goods manufacturers' sales, millions*	12,371	12,256	14,297
Machinery manufacturers' sales, millions*	3,810	3,808	4,281
Durable goods manufacturers' new orders, millions	12,292	12,512	13,160
Machinery manufacturers' new orders, millions	3,972	3,770	4,124
New Orders for Nonelectrical Machinery (1950=100)*	156	163	146
New Contracts for Industrial Construction (1950=100)*	75	73	157

* Seasonally adjusted

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. . . produce 10 times more holes per grind . . . increase production 80% . . . double the number of holes per grind . . . cut cost per hole . . . eliminate breakage . . . speed production at no increase in tool cost . . . average 13,000 more holes per grind.

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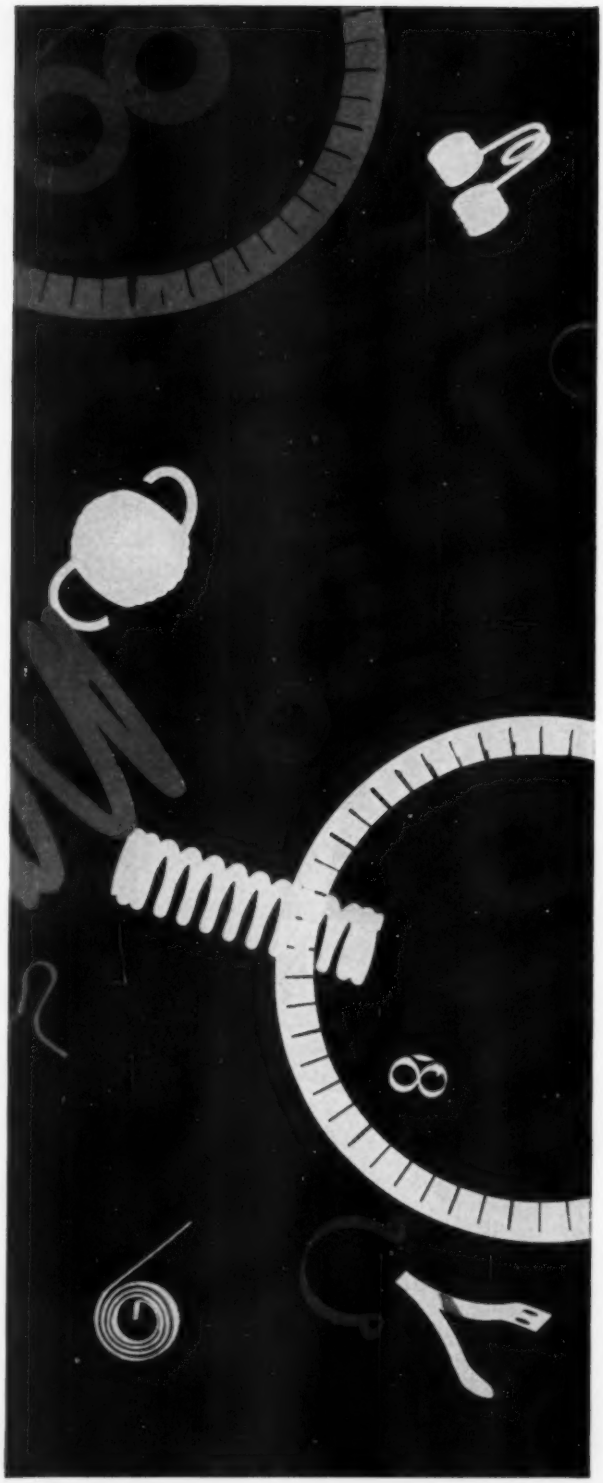

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American Machinist
MAGAZINE OF METALWORKING PRODUCTION • ESTABLISHED 1877

Strictly For The Birds

The U S Treasury Department and Congress have been blamed for the nation's inadequate tax depreciation policy on capital goods.

But who, except industry itself, is to blame for industry's own bad tax depreciation policy?

Since 1954 federal tax laws have permitted manufacturers to use the sum-of-digits method and the double declining-balance method to write off new production equipment. Either method allows management to recover its investment faster than before (though not as rapidly as sound economic policy would dictate).

The declining-balance method enables a company to write off its machines at double the straight line method. Two-thirds of the cost can be depreciated in the first half of the useful life, compared with one-half formerly.

Yet how many...

metalworking manufacturers are taking advantage of existing rules? In one segment of Metalworking alone, a professional estimate concludes that only three out of ten companies are doing so. It would not be surprising if that ratio held right across all of Metalworking.

Why this sluggish, indifferent attitude? Joel Barlow, prominent Washington attorney, has an answer. He charges that too many managements, for one thing, are reluctant to adopt a realistic depreciation policy because of the deleterious effect upon profits. Certain profit-sharing managements, he contends, are among the worst offenders. Short-term profits are preferred to the company's long-term well-being.

Some of metalworking managements are guilty of more than refusing to write off new equipment within the shorter allowable time. They do not spend for modernization and replacement the money set aside in their depreciation fund for that purpose.

Instead of investing in new equipment that will keep them competitive under today's fast-changing conditions, using their reserves to finance the purchases, they hoard these funds.

This policy...

is what one of our readers has labeled "intellectual dishonesty." He charges with intellectual dishonesty those manufacturers who accumulate a depreciation fund and then do not spend it for replacement of their obsolete machines.

The policy of not taking full writeoffs provided by law and of hoarding depreciation funds is indefensible. It tends to perpetuate inefficient manufacturing practices by keeping in service production equipment that has long outlived its usefulness. It prevents or at least seriously retards competition in world markets where prices are important (and price is dependent on low production cost).

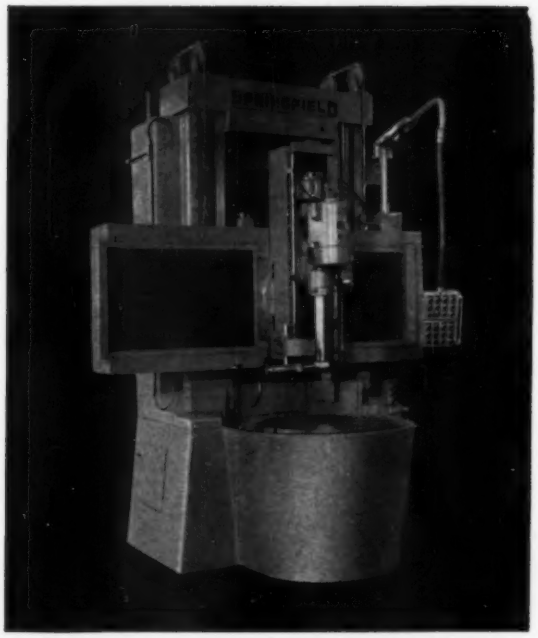
It lends aid and comfort...

to those government officials who are resistant to enactment of a realistic depreciation policy for capital goods. It is a serious drag upon realizing full profit possibilities.

It is a policy strictly for the birds. Every self-respecting management now indulging in it should abandon it in favor of a progressive policy of taking maximum writeoffs and spending each year its depreciation fund to stay modern.

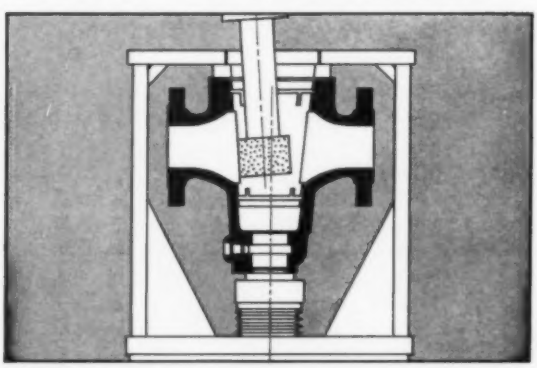
Burnham Finney EDITOR

Vertical grinding tapers profitably



Standard vertical grinder above is typical of those used by leading manufacturers of large valves for grinding internal taper seats. Profits are made because set up time is fast; for example, it takes about five minutes to change over from grinding 18″ valves to 10″ valves. The inherent rigidity of the machine is made doubly effective by gravity. Valve, fixture, and face plate are supported on a heavy *vertical* work spindle which promotes accuracy, precise concentricity, and extremely fine micro-inch finish.

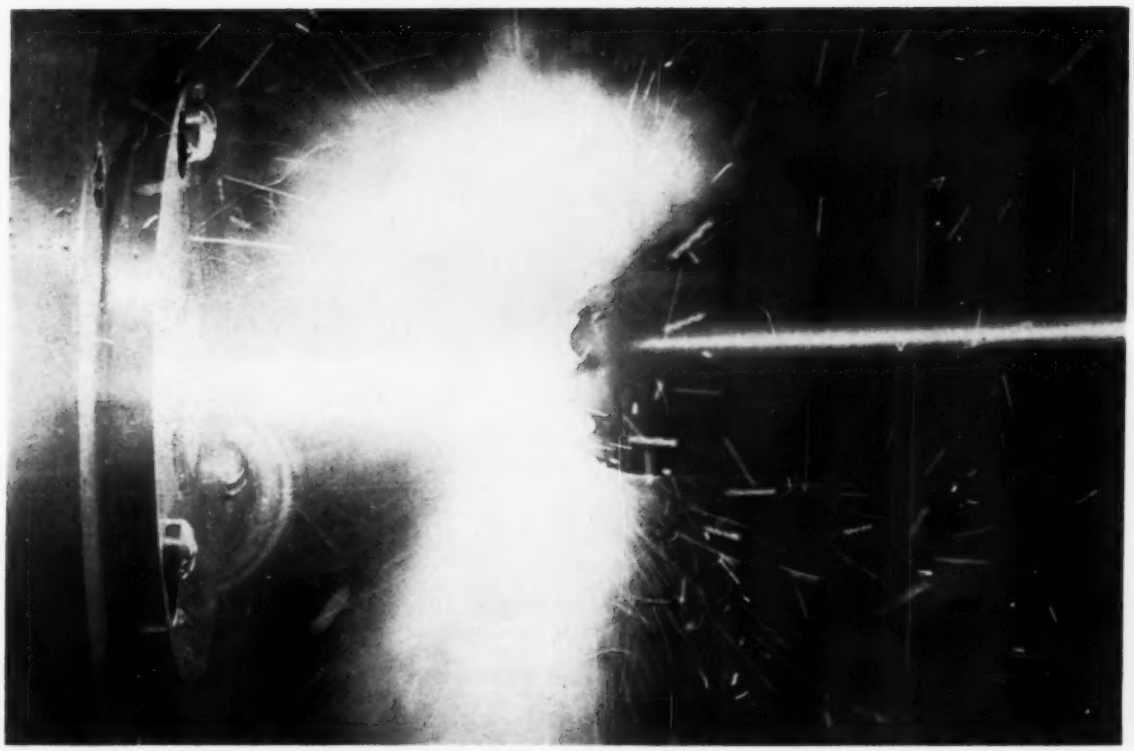
SPRINGFIELD



Internal valve tapers, as shown above, are fast payoff jobs on a Springfield Vertical Universal Grinder. On this valve taper, stock removal is 0.020″ with a requirement for 85% blue or better on a taper gage. Surface finish is held well within the 30 RMS specified. Machine swings to 52″, grinding holes from 2″ to 42″ dia., 24″ deep in irregular or regular shaped work pieces.

Not limited to internal or exterior tapers, a Springfield grinds efficiently on O.D. and I.D. shoulders, offsets, undercuts, irregular holes, and mating angles—usually in one chucking.

A few production and toolroom men turn to a Springfield because there's no other way to do the job. Most turn to a Springfield because it's the most profitable way to do many jobs. Write today for Bulletin No. 197-D. The Springfield Machine Tool Company, Springfield, O.



In two seconds, metal is vaporized by heat which exceeds its boiling point by many degrees

Plasma guns blast new production paths

Sustained temperatures of up to 30,000 F capable of vaporizing any known substance are produced by "burning" plasma. Out of the space laboratories comes still another startling "Buck Rogers" development with extremely practical and widespread production capabilities.

By William M Stocker, Jr, associate editor

A new heat source now is available for metalworking applications. A number of companies are either offering the necessary equipment for sale or will be offering it within the next few months. Other companies will offer new products and services.

This isn't just another gun for metal spraying. It is a development as new as plasma cooling for missile re-entry, as revolutionary as ion-propulsion for space travel. In fact, the plasma gun developed out of research in these fields. . . . . . .

Metallizing Engineering Company's Plasma-Flame Corp, a subsidiary in Westbury, NY, is offering two models, a 24 kilowatt hand gun and a 40 kw stationary unit. Larger sizes are coming soon. Giannini Plasmadyne Corp, Santa Ana, California, has shifted from manufacturing research laboratory sizes to a production model. Prices start at around $5000. The Linde Company, a division of Union Carbide Corp, is active in the field.

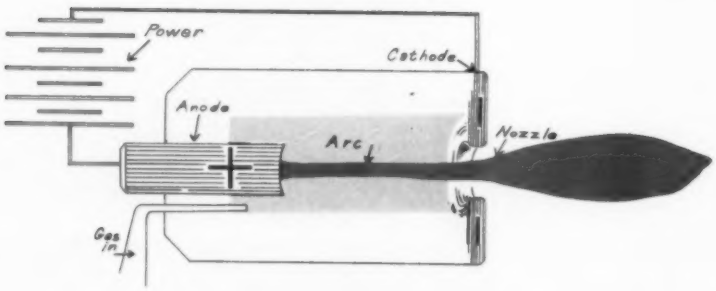
What will the plasma gun do? Temperatures in this range will vaporize *any known element*. From this vaporized condition, many of these elements such as tungsten, molybdenum, silicon, carbon, chromium, titanium, etc, can be deposited in controlled, uniform layers on metals, ceramics, intermetallics, and even on some plastics.

As a cutting tool, the plasma stream will knife through the toughest steels, the hardest materials, to leave a clean edge that can be welded with little or no surface preparation. Materials such as titanium carbide can be sliced and rewelded. Concrete can be drilled for studs, later fused in.

For straight heating, the plasma heat source can be applied to a furnace which will melt any material. Thus castings of metals such as tungsten or beryllium, or of ceramics like zirconium boride, will be readily produced.

If everything melts at this temperature, what material is used for the gun—especially for its nozzle? One method, used by the Plasma-Flame Corp, which claims operation for extended periods without nozzle or electrode erosion, turned out to be simple. But simplicity came only after a lot of frustration.

Like ultrasonic cutting, which becomes more efficient as the work hardness increases, plasma heating works better as melting point or refraction go up. After a variety of refractory nozzle liners melted, the problem was overcome with the best commercial heat conductor available —a water-cooled copper-alloy nozzle.



Plasma gun is simply an enclosed-arc chamber with an orifice, powered by a conventional d-c welding generator

Of course, most of the heat passes through the nozzle opening in the rapidly moving plasma. Only a small fraction of the generated temperature impinges on it.

What is "plasma?" To describe it more simply than scientifically, most of us have been taught to recognize three states of matter—solids, liquids, and gases. Now physicists tell us that matter exists in at least four conditions, and the fourth one is *plasma*. It has no connection with the blood plasma used in medicine.

Plasma is any ionized "gas" raised to a temperature at which it no longer responds to the recognized gas laws. Molecular gases break down into atoms and the atoms become electrically charged ions, a "plasma" of ions and free electrons. Plasmas respond to magnetic fields, as do electric-arc flames. By electromagnetic "valving," plasmas can be focussed, accelerated, slowed, aimed, shut off, and controlled in a variety of other ways.

How High Heat Is Achieved

What causes the super heat? In the plasma gun, one of a number of gases is forced at very high pressure and velocity through an electric arc. The power source can be a standard dc welding generator. Arcing occurs between the electrode (anode) and the nozzle (cathode). Electrons travel from cathode to anode; ions go the opposite way.

This high-current electrical arc is enclosed in a small chamber. Gas injected into the chamber tends to cool it, but in so doing produces two conditions which make the *arc* hotter. Cooling lowers the conductivity of the outer region of the arc. Thus, by an effect called "thermal pinch," current in the arc is restricted; resistance increases.

Next, a condition called "magneto-hydrodynamic pinch" provides further resistance to the current, which raises the plasma to very high temperatures. The forces and pressure developed eject the plasma through the nozzle as a foot-long beam of highly excited particles, which appears as a brilliant "flame."

Finally, one more effect comes into play. Just as there is the "heat of reaction" released when two chemicals combine, which we utilize for conventional gas welding, a great quantity of energy is absorbed from the arc by the plasma as the atoms of gas are transformed into ions. When these ions return to atomic form at, for instance, the surface of a workpiece, they give up this energy in the form of tremendous heat. Hence, the 30,000 F—which, incidently is neither the top limit nor accurately measured yet.

Inert gases such as argon or helium are commonly used as a source of plasma. They do not readily react with gun or work materials; rarely produce chemical effects. However, Plasma-Flame engineers say pure nitrogen is their most common plasma source. They tell us that the plasma heat source operates at a lower cost per BTU than oxy-acetylene units.

Materials fed into the high-temperature zone of the plasma stream are instantly vaporized, transported by the stream and deposited on the target, or work. Materials applied to date by Giannini Plasmadyne Corp include tungsten-chromium alloy, zirconium boride, titanium carbide, and molybdenum disilicate.

All oxidize in the presence of oxygen, have melting points above the oxy-acetylene range, and cannot be sprayed except as powders. A recently completed inert-atmosphere chamber demonstrates the feasibility of applying even hard-to-handle materials such as beryllium.

Metallic oxides of the light metals have high vapor pressures but are readily applied. Among these, magnesium oxide is useful because of its exceptionally high reflectivity. Beryllium oxide can be a useful insulator in high-temperature electronics. Coating is possible because the surface temperature of the metal being coated can be kept under 500F.

Even where coatings can be successfully flame-sprayed, the plasma process has advantages. Porosity of a plasma-applied coat is one-half to one-third that of a flame-sprayed coat of the same material, and further improvement is expected.

Vapor-phase alloying, in which various elements are mixed in the vapor condition and then condensed, is made possible by these temperatures. Many new materials and properties could result.

Opens New Fields

Producing new materials is another useful trick the plasma gun does with ease. Whole new fields of high-temperature chemistry may result. To spray coat with tungsten carbide, Plasmadyne's research group fed both materials, properly proportioned, into the jet simultaneously. Although the desired properties were obtained, analysis of the resulting material on a test specimen showed unusual X-ray powder patterns which could not be identified as tungsten or as either of the recognized tungsten carbides, WC or W_2C.

Plasma isn't new to the scientists but applications of it have only developed with the advent of high-temperature and missile propulsion problems. The "gas" in any electric arc is plasma; so is the "gas," at very low pressure, in a fluorescent light or in an electron tube. But these plasmas are not energized sufficiently to create these super temperatures.

Now plasma can be energized and manipulated to open untold stores of knowledge; to solve many manufacturing problems and create new ones. Metalworking has just scratched the surface in applying this significant concept which, at least, simplifies heat- and wear-resistance problems.

Overhead or vertical welding . . .
is now possible with CO_2 because of this auxiliary for conventional power sources. Connected to d-c ouput, the "Dynamic Reactor" limits the rate of current rise under drop transfer conditions to a value that allows the drop to melt off and be transferred to the pool of molten metal on the work

Muffler and tailpipe assembly . . .
made from 0.050-in.-thick mild steel, employs a lap fillet weld made automatically at 60 ipm with 0.040-in.-dia wire at 100 amp and 20-1/2 arc volts. Welds of this type are practically impossible to make on a production basis with other arc processes

Resistance and gas welding make way for a competitive process as . . .

CO_2 welds thin steel parts

CO_2 shielded-arc welding has just moved into a field once considered the exclusive province of resistance and/or gas welding—the joining (in all positions) of thin-gage steel automotive parts. Using a new Westinghouse development, the "Dynamic Reactor," automotive manufacturers are now MIG welding radiator components, mufflers, tailpipes and other thin metal parts for the first time. Operations are both automatic and semi-automatic.

Welds in All Positions

For instance, in one automatic operation a CO_2 butt weld is made without backup in 22-gage mild steel, employing 1/16-in. dia wire at 80 ipm. And in a semi-automatic setup, 3/64-in.-dia aluminum wire is used with currents as low as 100 amp. In fact, semi-automatic equipment is now handling overhead, vertical, or any other positions in mild steel, aluminum, or stainless.

In conventional CO_2 welding, each wire size has a minimum operating current at which metal transfer in spray form begins. Currents that provide spray transfer with ordinary wire sizes (3/64 in., 1/16 in., etc) have been too high for out-of-position work or thin gage materials. Current below that required for producing spray transfer of metal has resulted in wild, explosive arcs. For instance, minimum current usable with a 1/16-in. dia electrode has proved in tests to be in the neighborhood of 300 amp.

With currents of this order, the CO_2 process has so much penetration that the minimum metal thickness practical for butt welding is 1/8-in. —requiring a copper backup plate to absorb heat. Even then the weld tends to stick to the backup plate—resulting in high maintenance costs on the backup bars.

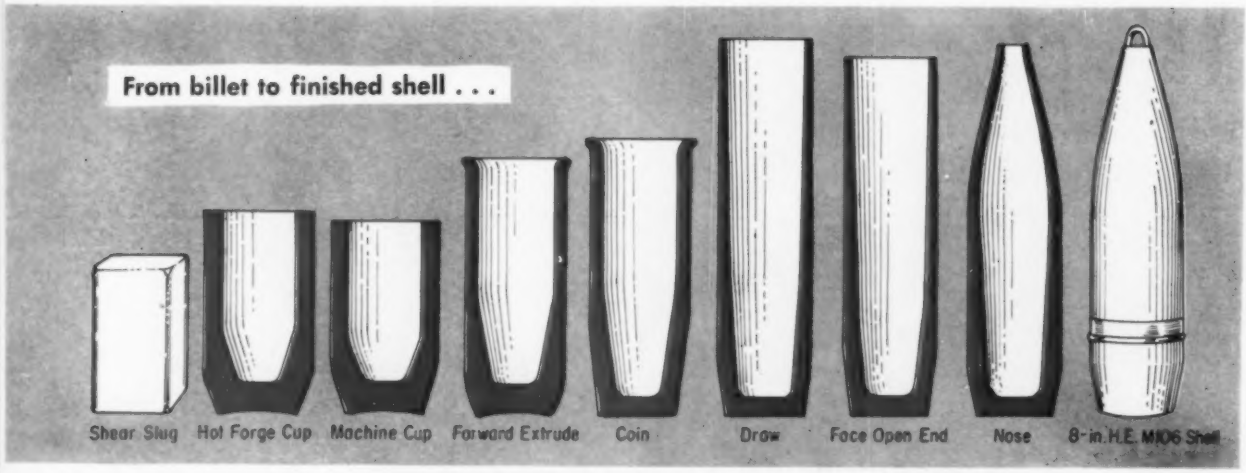
Lower Current Possible

Now, butt welds are made on 0.040-in. material with electrodes of the same diameter. Wires from 0.040-in. to 1/8 in. diameter are used at currents from 75 to 800 amp, whereas 0.040 to 0.091-in.-diameter wires were formerly used at 200 to 600 amp.

Unusual Power Supply

A new type of power supply developed by Westinghouse is responsible for the results. "Dynamic Reactor" reduces minimum welding current by a factor of more than 2 to 1 when used with automatic and semi-automatic welding equipment. The static, two-terminal units are connected in series with either of the welding current leads.

By limiting the rate of rise of weld current, the reactors permit use of lower currents and the transfer of weld metal in droplet form. The lower currents and droplet transfer in turn permit the use of larger and less expensive wire sizes, provide depth control of weld penetration, and all-position welding.



Hot-cup/cold-draw process makes 8-in. artillery shells as . . .

Cold extrusion moves into the big time

Hot cupping of billet is done on H-P-M hydraulic press at 2150 F. Low-carbon-steel billet weighs 190 lb. Prior steps include shearing the billet to length and heating it in a series of induction heating furnaces. After the hot forging step, the cup goes to an automatic lathe, where the OD, profile and length are rough machined, and then to a conveyorized lubrication tank

A combination of hot forging and cold forming, developed by the American Car and Foundry Div of ACF Industries and now in operation at its Berwick, Penna, plant, produces superior quality high-explosive shells for the Army's 8-in. howitzer. Advantages of the process include:

- **Less starting material**
- **Low-carbon steel**
- **Simpler heat-treating**
- **Less machining**

Cold extrusion of steel parts is not new. The Germans made small-caliber ammunition (up to 40 mm) in this way during World War II. And Detroit is currently extruding connecting-rod wrist pins. But to turn out a 160-lb artillery shell is a far more complicated problem.

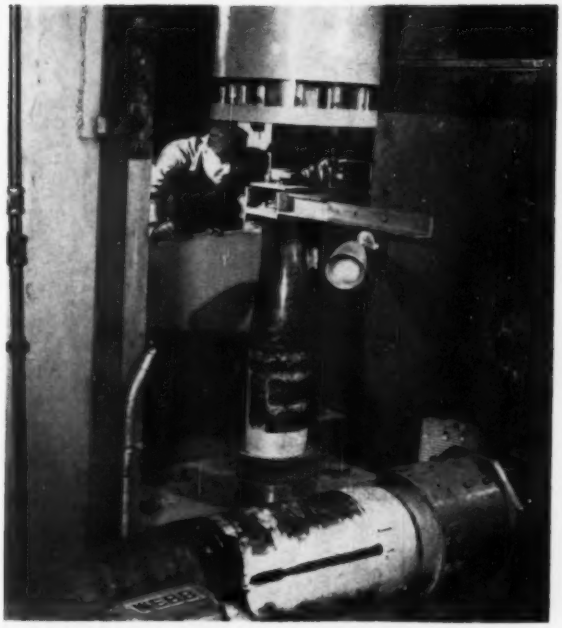
The conventional method of producing artillery shells involves hot forging a medium-high-carbon-steel billet to the general shape of the shell and then machining it to the required dimensions. Then it is heat-treated for hardness.

ACF's hot-cup/cold-draw process takes a low-carbon (0.20% max) steel billet and forms it to final shape at room temperature; the desired mechanical properties are achieved through cold working. Basically, the process consists of one hot forging step and four cold forming operations. Current production rate is 125 shells per hour.

Manufacturing sequence

From the point where the uncut billet is picked up and fed to the

Cold forward extrusion forces the cold steel to flow through a shape-forming die. Photo shows punch withdrawing from an extruded part while the next piece is being brought in by the loader (left). Subsequent steps include lubrication, coining, drawing and further lubrication



One-step nosing operation requires no internal support. In one press stroke shell takes on exact shape required, with no apparent upsetting or corrugating. Final steps include stress relief, machining fuse hole, attaching the rotating band and the base plate, and spray painting

shear to the point where the finished shell is loaded into box cars for shipment to the loading plant, the shell line is fully mechanized. The H-P-M hydraulic presses are equipped with loaders and unloaders; conveyors—over a mile of them—connect all of the manufacturing operations.

A large shear cuts the 7⅜-in.-sq. billet to length. This 190-lb billet is heated in a series of induction heating furnaces and then passes to the hot forging operation, where it is forged into a cup at 2150 F. Next step is a rough machining that faces the open end of the forging and cleans up the outside surface.

Then comes the first of three "phos-lubrication" treatments. Reported to be the key to cold extruding heavy steel shapes under extreme pressure, the phos-lube treatment consists of coating the steel part with zinc phosphate which acts as a host for a soap lubricant.

The cold forward extrusion operation actually squirts cold steel through an orifice. The partially formed shell then goes to an induction heat-treating station where the lip formed in the extruding operation is annealed. Following in sequence are a second phos-lube treatment, coining of the shell base, and a drawing operation.

A nine-station machine then cuts the piece to length and expands the bourrelet section. (The bourrelet is the accurately machined surface, of slightly larger diameter than the shell body, which bears on the lands of the bore in the weapon. It centers the projectile in its travel through the bore.) Before the nose is formed, the open end of the piece is annealed and the entire piece is phos-lubricated once more.

The nosing operation is performed in a single press stroke, without any internal support. No upsetting, fluting, corrugating or wrinkling have been encountered.

After nosing, the shell has the required dimensions and is ready for a salt-bath stress relief treatment and the final machining operations. From the salt-bath tanks, the shell goes to a bourrelet grinder; to a 14-station machine which faces the nose; bores and taps the fuse hole; then machines and knurls the rotating-band groove. The rotating band is dropped over the shell and pressed into its groove. (The soft rotating band is engraved by the lands of the bore as the shell is fired, imparting rotation to the moving projectile.)

A thin metal disk, called the base cover, is welded to the shell base to prevent the hot gases of the propelling charge from coming into contact with the explosive filler of the shell through possible flaws in the metal of the base.

After passing through a government inspection station, the shells are spray painted, then palletized and loaded into box cars.

Process saves material

The billet weighs 25% less than that used for conventional manufacture of an 8-in. shell. In addition, only two selective induction heat-treatments are required; the conventional process calls for a full heat-treat cycle involving heating to the austenitic range and oil quenching, followed by a tempering prior to final machining.

Only 25 to 30 lb of metal is removed by machining; the best conventional practice calls for the removal of 60 to 70 lb. Furthermore, the surface finish of the hot-cup/-cold-draw shell is less than 40 mu-in.; conventional machined shells are allowed a surface finish of 250 mu-in. All of these advantages could apply to the manufacture of any large steel hollow forging.

Military advantages

The new shells, when fired, showed greater range, better firing patterns, and fragmentation-size distribution equal to or better than conventional shells. Most of these extruded shells weigh within a half-pound of the norm—in contrast to a 4-lb 13-oz tolerance for conventionally made shells—and as a result necessitate less field adjustment in the powder charge or artillery piece.

Here's actual production proof . . .

AUTOMATIC CONTROL does pay off!

. . . and it is breeding an entirely new generation of machine tools able to work once "impossible to machine" metals to tolerances and contours that the Space Age demands—at less cost per piece, and at never-before-achieved production rates

Once labeled "expensive gadgets," numerically controlled machine tools are today coming into their own in an ever-widening variety of metalworking applications. In the few short years that they have been in existence, these machines have time and again shattered production records, cut machining time and costs drastically . . . and they are almost daily opening new metalworking frontiers.

Let's look at the actual production record. Boeing-Wichita, for instance, has seven numerically controlled machines in operation (three skin mills, three profile mills, one combination profile and contour miller). On the average, these machines have been saving the company something like 80% over conventional machining methods—sometimes in machining time, other times in the cost of dies and templets.

Some intricate parts turned out by Boeing's numerically controlled machines would recover the cost of the machines in savings on 100 pieces.

Boeing reports, too, the cost of planning, programming and tape preparation (in spite of some widespread opinions to the contrary) is only a small fraction of the expense involved in tooling and setup for conventional machining.

For example, 42 fixtures (cost: $33,772) were needed to tool up one forging on a tracer-controlled machine. The part was transferred to a numerically controlled mill, where it was machined on 14 fixtures costing $7625. Tape preparation took only a few hours.

Another Boeing example: A lower-wing panel machine on an AMC 24 spar mill required 1600 ft of templets costing $12,554. Transferred to a numerically controlled skin mill, the entire part was completed with nine reels of tape at a total tape-preparation cost of $1094.

Boeing's experience with numerically controlled machine tools was described by William D Beeby, chairman of the company's Numerical Control Subcommittee during the American Institute of Electrical Engineers' Tenth Annual Machine Tool Conference in mid-October at the Statler-Hilton in Hartford, Conn.

Virtually every paper presented at the meeting dealt with some phase of control—numerical, motor, machine or computer. Some 688 engineers and operating men attended.

Two brand-new machine tools, designed for general-purpose use under discrete numerical control, were described during the sessions. One, the Milwaukee-Matic, developed by Kearney & Trecker Corp, might be described as an automatic jig miller. The other, an automatic vertical turret lathe, is a product of Giddings & Lewis Machine Tool Co's Kaukauna Division.

The latter machine is powered by a 50-hp ac induction drive, providing a speed range of 18 to 1. Also available are 16 feeds plus rapid traverse. Pre-programmed punched tape provides full control of both heads, speeds, feeds, turret indexing, and of all auxiliary functions.

Tooling for missiles, specifically the Titan, was described by C L Phillips, supervisor, Tool Design & Fabrication Planning, The Martin Company, Denver, who outlined manufacture and test procedures for a fuel tank and some typical missile components. Whether he intended it or not, one got the impression that "chemical milling" was especially popular.

To clarify the general but unfounded idea that missile production presents many complex machining and fabrication problems, Mr Phillips pointed out that missiles have no wings, fins, rudders, movable surfaces, landing gear or spars. Therefore, practically all complex machining on castings, forgings, and long extrusions is automatically minimized. Fittings and weldments used on the Titan are made by conventional machine tools such as lathes,

mills, jig-borers, Hydro-tels, and drillpresses.

Because missiles are generally cylindrical, there is very little complex sheetmetal forming on compound curvatures. Thus, no large forming presses or drop-hammer equipment exists at the Denver facility. Instead, facilities consist of shears, press brakes, punch presses, bandsaws, slip-rolls, routers, and stretching equipment.

Will this trend in facilities continue? Mr Phillips thinks the answer is "No." He says that further in the future, during the transition from ballistic missiles to manned space vehicles, the change from non-ferrous to ferrous "super" metals and to ceramics will call for powerful cutting and forming forces once again.

Returning space vehicles to Earth, he said, requires mechanized control systems for flight re-entry, such as retractable control surfaces, blast tubes, or other variable control devices. This problem means not only an increased quantity of castings and forgings but a greatly increased sophistication in machine tools and manufacturing techniques.

Magnetic-control experience

Four sources of trouble account for 60% of all shop electrical troubles, according to an in-plant study reported by L S Thomas, chief electrician, Pontiac Motor Division, General Motors Corp. And his paper discussing operating experience with magnetic controls showed the top troublemaker to be the limit switch, which accounts for 28% of the total. Next in line are solenoids (19.5%), relays (8%), and defective wiring (4%). Results are from an analysis of carefully maintained and IBM-tabulated "trouble cards."

Mr Thomas pointed out that in the laboratory limit switches average 3,500,000 operations before the first failure. In the shop the first failure occurs at an average of 650,000 operations. Improper application and actuation are principal causes of failure.

59% of 4325 trouble calls for solenoids turned out to be mechanical faults, such as linkage failure or broken pins. Only 35% were for opens, burn-outs, or shorts in the circuits. Approximately 90% of Pontiac's solenoid failures occur on solenoid-controlled hydraulic valves.

In reviewing developments in static-switching control, D A Entrekin, chief engineer, JIC Electric Co, mentioned that output relays have been introduced to replace the magnetic amplifiers which provide the final output stage of a static control system. With the same life as conventional machine-tool relays, these devices help to bring the cost of static systems down.

A new dc water-cooled, shell-type spindle motor and controller was described by A P Bowman, manager, Milwaukee district, Allis-Chalmers Manufacturing Co. Control equipment, providing infinite speed adjustment from 50 to 6000 rpm, uses static components. Motor was developed for integral installation on machine tools in cooperation with engineers of Ekstrom, Carlson & Co, Rockford, Ill, for use in this company's new line of contour milling machines. In this instance, the motor provides 10 hp; is 13½-in. dia by 28 in. long.

Tube vs transistor

In comparing tubes and transistors for machine-control applications, it pays to evaluate shop needs in shop terms and not on the basis of things sought by a missile designer. This was the heart of a graphic analysis of the two kinds of devices given by Herbert P Grossimon, VP and chief engineer, Concord Control, Boston.

Occasional failures aren't critical in machine control. The important industrial requirements of long trouble-free life and low cost must be kept in mind. Items such as missile-grade (must work first time) reliability, cost of input power, and miniaturization are secondary. Placement of emphasis on these factors is highly influential in both the cost and the success of machine controls.

The tube is still a more versatile performer than the transistor. Many more tube types are available than transistor types. Tubes can more easily handle special cases; their cost is low and their reliability is good.

Transistors dissipate less input power than tubes. They are more efficient power control devices. Most important to the machine-control field, reliable transistors can extend system reliability even further. As system designs become more sophisticated, to meet the increasing demands of control-system specifications, reliability gains further importance. Today, transistorized systems cost more—but costs are expected to come down soon.

Transistors are seriously challenging tubes for machine control. However, new tube systems will still outnumber new transistor systems for several years to come. Ultimately, with decreasing transistor costs and increasing transistor developments, with broader education of transistor-circuit designers, the challenger may very well become the champion.

However, a record of the causes of downtime, described by Mr Grossimon, shows that neither tubes nor transistors are major factors. The real losses are from electromechanical components.

In an average of 100 8-hr shifts, in a 300-tube or transistor control system, tubes accounted for 24 hr of downtime while transistors cost only 8 hr of downtime. With either tubes or transistors, electromechanical failures caused 60 hr of downtime.

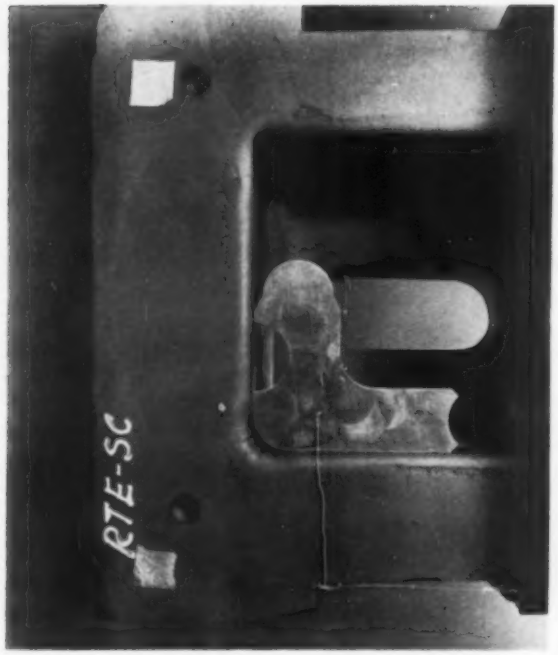
Until this problem is solved, not much can be done to improve overall reliability. Nevertheless, the tube system showed an overall reliability of 88% up-time for 100 8-hr shifts.

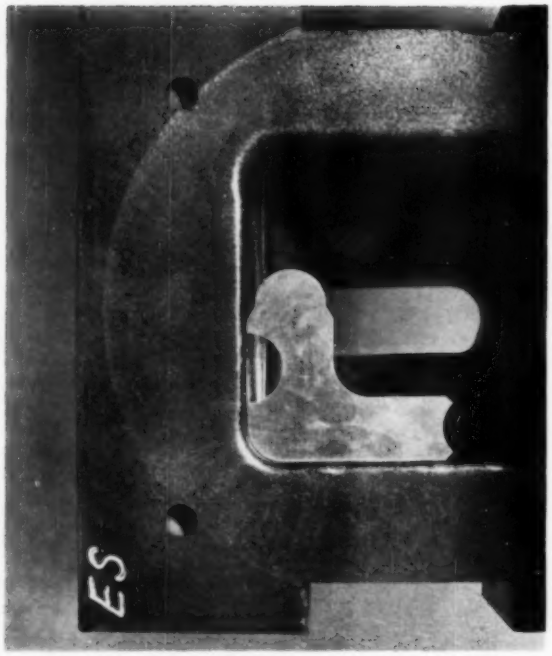
Stick-slip effect, or "minimum motion," is an accuracy limiting condition caused by any two surfaces in mutual contact that experience different friction coefficients when at rest and when in motion. Contrary to popular belief, it can be controlled and need not be a limiting point of adjustment in machine capability.

Arthur Parnes, project engineer with Airborne Instruments Laboratory, a division of Cutler-Hammer, Inc, described the use of constant *energy* rather than constant force to provide close control. The Inchworm motor operates by providing a predetermined constant energy of sufficient strength to overcome both static (stick) and dynamic (slip) friction resistances.

Constant energy is also applied by the machinist when he moves the tool-slide 0.0002 in. by taking up the backlash with a handwheel and then hitting the machine with a lead hammer—but the physics involved isn't appreciated. When constant force is applied to the handwheel, static friction is overcome and then the stored-up energy sails through the dynamic friction to overshoot the desired distance. The hammer is better because it puts in a known quantity of energy; however, it isn't as reliable, naturally, as a controllable instrument such as the Inchworm.

What about the future of automatically controlled machine tools? Meeting keynoter Swan E Bergstrom, executive vice president, Cincinnati Milling Machine Co, said that metalworking today is going through the greatest period of transition in its history—from manual control to mechanization—and into a new and fabulous era of automatic control.





Draw dies were tested by running production parts—electrical terminal boxes—in identical dies made from several materials. A conventional die (left) with a cast-iron core and surface of room-temperature epoxy showed severe erosion and wear at its corners. An ES die (right) exhibited ridges in the glass-fiber filler, but it wore significantly better

Metal fibers beef up plastic dies

By A P MASZUCCHELLI, assistant director, development laboratories, Bakelite Co, Bound Brook, N J

Longer wear, better heat properties, and higher accuracy are the results when cast epoxy dies are filled with metal fibers. Special new technique where short fibers are flocked to outside wear surfaces improves die life. One of these dies has drawn 130,000 auto-radiator tank tops in 0.025-in. brass, indicating that plastic dies may now be extended into medium-run service

Cast epoxy resins with metal-fiber fillers, instead of more conventional metal-powder fillers, promise longer life, better stability, and higher strength for metal-forming tools. Press dies made with three new resin-filler systems have been built for about a dozen production parts, on which they showed an ability to go beyond short runs and get well into medium-size production lots.

Three new formulatons are based on pressure-cast heat-resistant epoxy resin filled with:

1. Steel fibers, including shorter steel fibers flocked onto the pattern to reinforce the working surfaces.
2. Aluminum fibers with aluminum flocked to the wear surfaces.
3. Glass fibers with steel fibers flocked to wear surfaces.

In all three cases the dies exhibited tougher structure, and with metal fibers and flocking the dies conducted heat better and wore better.

Die Construction

Press tools are built by spraying or brushing a thin layer of epoxy over a pattern treated with parting agent. Short fibers—around ¼ in. long—are added with a flocking gun. Then resin is added, followed by a charge of metal fibers roughly ¾ to 2 in. long. Ratio by weight of the filler to the resin is around 60-40 for steel, 50-50 for aluminum and glass. The mold is closed slowly to allow the metal fibers to sink into the resin, and 200-300 psi is applied until exothermic heat cures the mold. Post curing for several hours, depending on mold size, completes the job. When glass fibers are used, a premix with resin is charged into the mold, and only 50-100 psi pressure is applied.

The result, particularly for the metal-filled product, is a die that can stand heat of 350 F, can be more easily machined than metal-powder-filled dies, and has at least double the impact strength of unfilled epoxy tools. Advantages for the fiber-filled dies include higher heat-distortion points and better control of exothermic heat, which allows casting tools of practically unlimited size.

There is lower danger of bond-line rupture between the plastic die surface and the metal core of many conventional plastic dies, and there are fewer internal stresses. Dowels, screws, and inserts are retained better because of the fibrous composition. Gall, creep, wear, and erosion resistance are also improved.

The metal-fiber-filled epoxy dies tested, although superior to all other plastic dies, still wore in service more than Kirksite, but stability was better because of less creep.

ES punch produced radiator tank tops for regular automotive production line. After about 500 stampings were drawn, a 0.06-in. flange at the trim line began to wear, but this was repaired by recasting the worn spots

Heat qualities and machinability are better with the metal fibers than the glass, but glass fibers allow simpler production equipment and more complex and larger die shapes.

Production Runs

Dies built for practical production parts have shown that the metal-fiber-filled materials allow less erosion than former plastic dies. Although plastic dies will not hold sharp edges as well as Kirksite, one sample die stood up under the compressive force when run 0.080 in. under metal clearance.

One of the first type ES (steel filler and flocking in epoxy) punches built was for an automotive radiator top tank. This formed 0.025-in. brass, running with a conventional iron draw ring and pad. During the run a 0.06-in. flange at the trim line began to wear after 500 stampings, but this was repaired by recasting after 4000 stampings. Otherwise, no trouble developed, even with a steel insert screwed into the filler-neck section.

On the basis of this experience, a complete radiator draw die was built by casting it in a steel box that formed the draw radius and surface, and used with a steel draw ring. Thus, the costly contoured surfaces of the die were ES, and the hard-wearing straight sections were steel. The die has drawn 130,000 parts.

One rib radius changed eventually from 0.045 to 0.060 in., but this was still within part-design limits so no change was made in the tool.

Die cost was $2225, compared with $3000 to $5500 for an equivalent steel die, estimated by an independent shop.

In addition, refrigerator panels, metal trays, and aircraft parts have been produced with ES dies. Generally some small amount of die wear around sharply-contoured rib sections may develop, but these contours are often not critical and the die may be kept in service through a comparatively long run. See accompanying list of sample production parts.

What to Look For

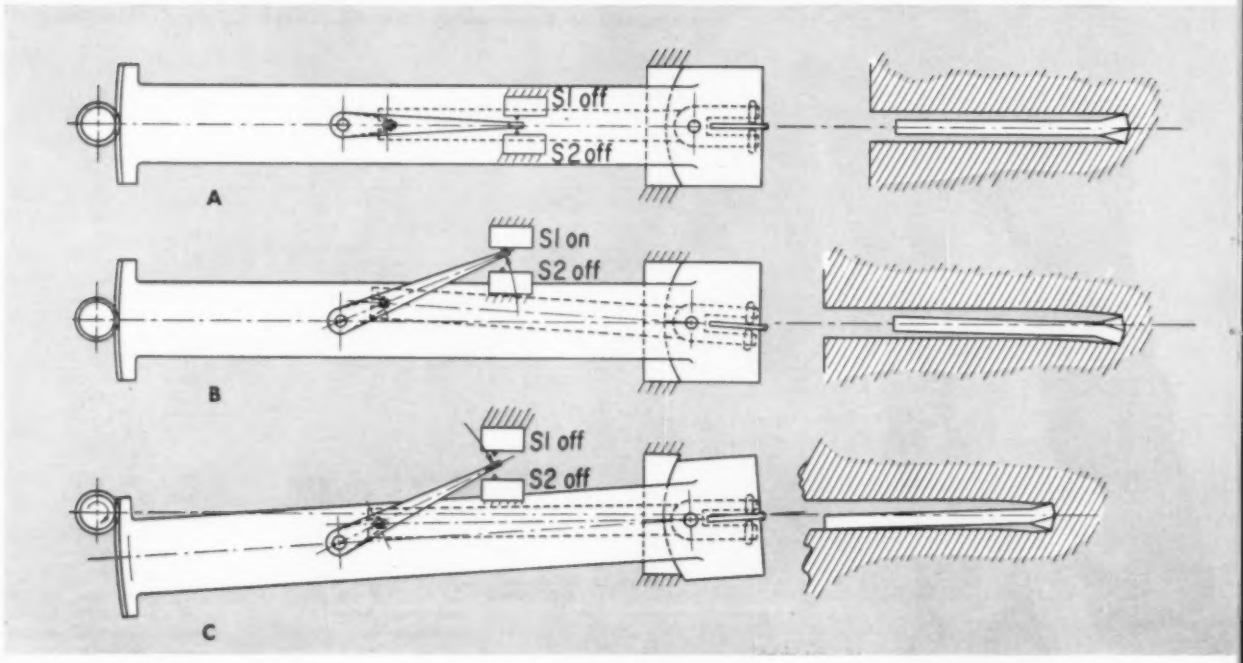
Present production dies with metal-fiber fillers have outstanding performance, and can have heat conductivity equivalent to a poor stainless steel. They can be easily machined, and can be made magnetic (ES type). Shrinkage problems are minor, and die repair is easy.

But improvements can still be made. Needed for future long production runs are lower processing costs, increased die-surface hardness, higher heat resistance, and improved and mechanized fabricating methods.

Performance of Commercial Fiber-Reinforced Epoxy Compositions

Name of Part	Type Part	Composition Cast	Approx. Part Size & Draw in.	Performance Record
Radiator Top Tank	0.025" brass	ES Punch Iron die & ring	4 x 23 x 3	Completed 11,000 stampings. Flange (0.06") at trim line repaired after 4,000 pc
Radiator Top Tank	0.025" brass	ES Punch & Pad. Iron ring	4 x 23 x 3	130,000 stampings. Steel trim flange & ring. No Maintenance
Refrigerator Bottom Panel 1st & 2nd draw	.036" C.R.S.	ES Contoured Punch & Pad. Steel rings	16 x 21 x 1¼	65,000 panels. No maintenance. One .08" draw radius increased to .19" after 5000 panels, remaining unchanged as .44" after 15,000 panels
Charcoal-Broiler Tray	.029" C.R.S.	ES Punch EG-SF Die & ring	21 x 27 x 1	1000 panels. Draw radius increased from .031" to .11". Now running with metal plate draw radius insert
Cover Draw Die	.050" C.R.S.	ES Punch EG-SF Die & ring	21 x 22 x 5½	Completed 1000 stampings. Draw radius increased from .125" to .25" after 300 and to .50" after 700 additional stampings.
Aircraft Housing	.040" alum.	ES Punch & upper ring. Ampco-bronze inserted polyester/glass lower ring	28 x 15 x 3½	500 stampings. Indicated no need for bronze inserts if ES lower ring used. Aluminum was not scratched
Aircraft Reinforcing Section	.045" stainless	ES-SF Punch & Pad	4 x 10 x ½	200 parts. Draw radius .37" unchanged; .06" radius ends increased to .18" and required metal inserting
Aircraft Part	.065" stainless	ES Punch. EG-SF Die Steel rings	25 x 16	Still running after 200 parts. No difficulty
Stringer Z Section Radial Forming Die	.032" stainless	ES on aluminum core	40 x 2½	Still running after 80 parts. No difficulty
Refrigerator Bottom Plate	.038" C.R.S.	ES Punch, Die & Ring. Metal beads	36 x 29 x 3	Tryout approved. Production abandoned.
Plastic Sign, Vacuum Forming Die	cellulose acetobutyrate methyl methacrylate	ES	22 x 24	Still running after 2000 parts. No difficulty

Typical fiber-reinforced dies have produced these parts. Quantities of work produced and any special problems are indicated in the right column



Blade steered on straight path . . .
Top sketch shows normal straight cutting. If blade veers (B), switch 1 is tripped to power pinion rod and change guide angle (C). Switch 1 goes off. When blade has partly returned to straight path (D), switch 2 is activated to bring the guides partly back; then switch 2 turns off (E). As blade returns to straight path, switch 2 is turned on (F) until guide bars are recentered.

"Steering-Gear" bandsaw stops blade runout

By Frank J Lindholm,
design engineer, Armstrong-Blum Manufacturing Co, Chicago

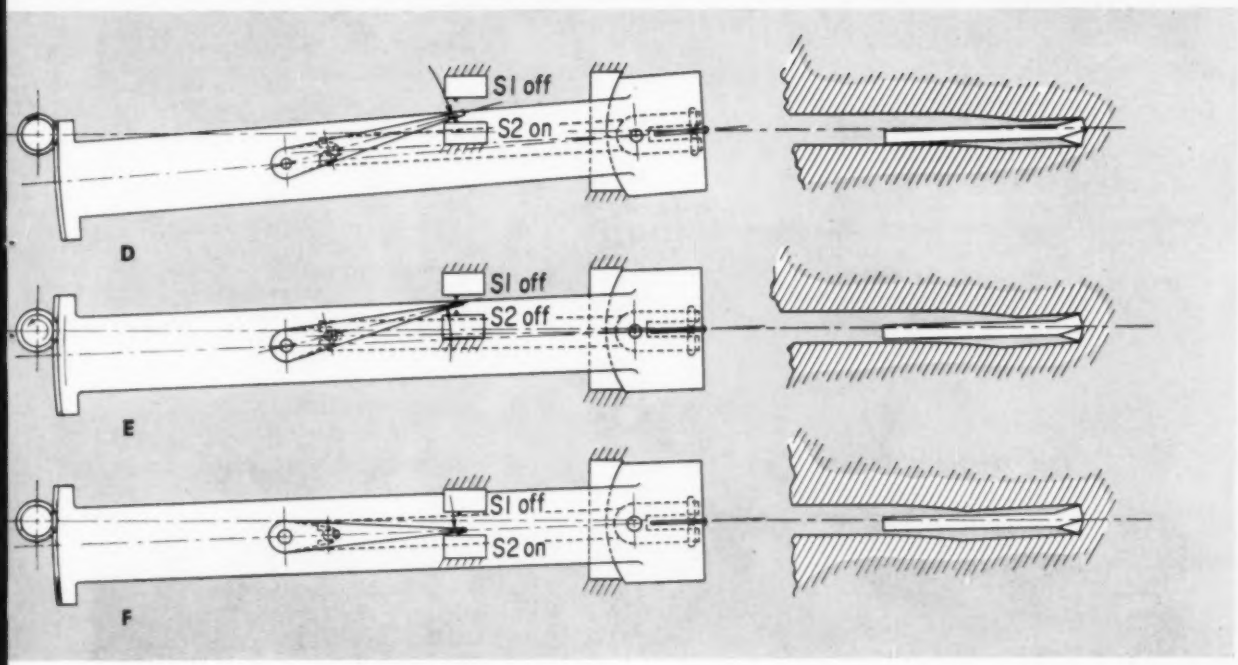
Worn, imperfectly set bandsaw blades can be guided straight, and blades in good condition can be held to saw within tolerances of a few thousandths with a recently developed, simple electro-mechanical servomechanism. This "Sure-Line" device was developed as an integral part of the basic design of the new No. 81 Marvel bandsaw to continuously sense and automatically correct any tendency of the band blade to drift to either side of a desired line of cut. The unit literally "steers" the blade to make it cut on a straight line.

Carefully controlled tests prove cutting accuracy can be tremendously improved and blade life can be increased more than 50% with this device, on which a basic patent application has been made.

A bandsaw blade is a balanced tool and cannot be rigidly held within a cut; thus, it is susceptible to inaccurate cutting, due to the imbalance of wear on the teeth, as well as the inaccuracies which occur in blade manufacturing. Any unbalance will cause the blade to drift in the direction of the least resistance—the sharper side. However, if the blade can be pivoted about its cutting edge, it can be forced to follow a straight path.

The device consists of a sensing element, guide heads, pinion and gear segments, amplifying unit, and necessary electrical and mechanical equipment. Two carbide-tipped contact points in the sensing element, mounted on the upper guide head, detect lateral departure of the blade from a straight line. This departure, however minute, is mechanically amplified to actuate electrical switches which energize a reversing motor to rotate a vertical pinion rod con-

"Sure-Line" sensing element consists of carbide contact points that operate switches. Signals are amplified to actuate a reversible motor, to thus rotate a vertical pinion rod (right) that swings guide arms through gear segments. Blade guides are rotated around an axis centered on the tooth edge to bring blade back to straight course



Note: For these tests, blade guides were accurately centered and the "Sure-Line" disconnected. Recommended speeds and feeds were set and rigidly held. Repetitive cuts were made and the degree of accuracy noted. After a reasonable number of cuts had been made, indicating a uniform pattern of runout, the "Sure-Line" was connected. With all other conditions remaining the same, improved accuracy was obtained in all cases as tabulated.

necting by gear segments the upper and lower guide arms which carry sturdy carbide-faced blade guides. Sketches show how the unit operates to keep the blade cutting in a straight line.

Accuracy and blade life tests were conducted under laboratory conditions to evaluate the effectiveness of the "Sure-Line" device. This series of tests used high speed blades—all from the same manufacturer and lot, cutting carefully inspected round steel bars. Blade speed, cutting rate, and coolant mixture were uniformly maintained.

Two series of tests were made: The first to determine the degree of improvement in cutting accuracy, and the second to find how much extension to blade life might be expected based on an established tolerance of run-out within the width of the work. All tests were run at normal speeds and feeds to give a production rate of cutting considered commerically practical. Tables 1 and 2 tabulate the results of these practical tests.

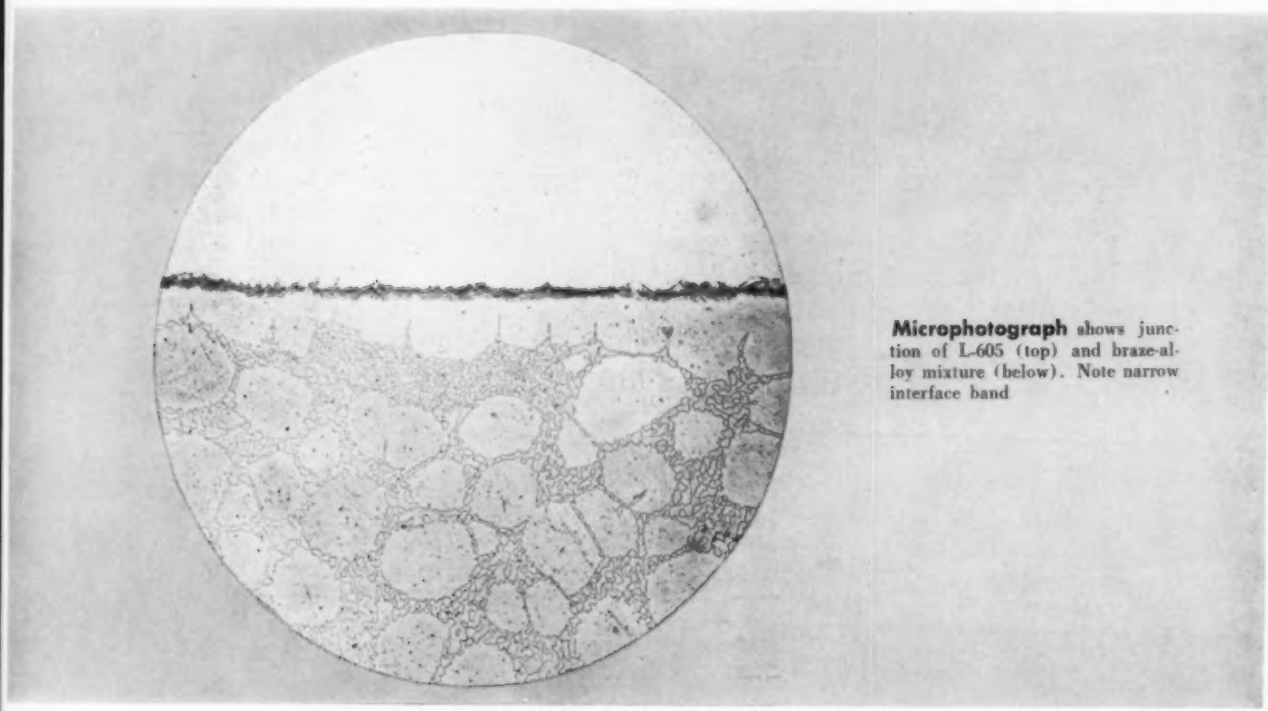
TABLE I—ACCURACY TESTS

AISI Material	Bar Dia (In.)	Runout ("Sure-Line" Disconected) (In.)	Runout ("Sure-Line" Connected) (In.)
1045	4	0.019	0.009
C1117	6	0.035	0.014
1045	10	0.290	0.018
4140	14	0.091	0.020

TABLE II—BLADE LIFE TESTS

Blade Number	Average Cutting Rate (Sq ipm)	Sq in. Cut Before 0.050-in. Runout With "Sure-Line" Disconected	ADDITIONAL Sq in. Cut Before 0.050-in. Runout With "Sure-Line" Connected	TOTAL Sq in. Cut	Increased Blade Life, %
1	10.1	10,400	5,300	15,700	51
2	10.2	14,830	8,350	23,180	56
3	10.0	10,050	1,380	11,430	13
4	10.1	8,780	3,371	12,151	38
5	9.9	5,840	5,390	11,230	92
Average	10.0	9,980	4,758	14,738	51

Note: A 5-in.-dia round SAE 1045 hot rolled steel bar, free from all foreign inclusions and certified for hardness and chemical analysis, was used. The "Sure-Line" was disconnected and the blade guides accurately centered. Hydraulically controlled blade feed and speed rates were set to give an average cutting range of 10 sq in./min. Repetitive cuts were made until a runout out of 0.050 in. occurred within the width of the work for three consecutive cuts. This we considered the limit of commercial tolerance. At this point, with all other conditions remaining the same, the "Sure-Line" was connected and the cutting continued. Accuracy was immediately improved and repetitive cuts were again made until a runout of 0.050 in. occurred for three more consecutive cuts.



Microphotograph shows junction of L-605 (top) and braze-alloy mixture (below). Note narrow interface band

Wide-gap
brazing alloy assembles engine rings

New brazing alloys join such difficult materials as high-temperature nickel-base alloys with high titanium and aluminum content. They hold blades to rings in nozzle diaphragms for gas-turbine engines

By R C Kellner,
fabrication development engineer,
Aircraft Gas Turbine Div,
General Electric Co, Evendale, O

High-temperature alloys can now be joined with bonds almost as good as welds by a family of new brazing alloys that work on practically any metals, including such problem materials as L-605 alloy, which is half cobalt and only 2½% iron.

Several distinct and unusual advantages are reported, in addition to the fact that these brazing alloys can be made to fill gaps between parts, which means that close fits and tight fillets are not essential. Gaps can be as large as 0.06 in., sometimes more, which also means some stress-relief in assembly may be gained during brazing cycle, which is at 2100 F. Other features:

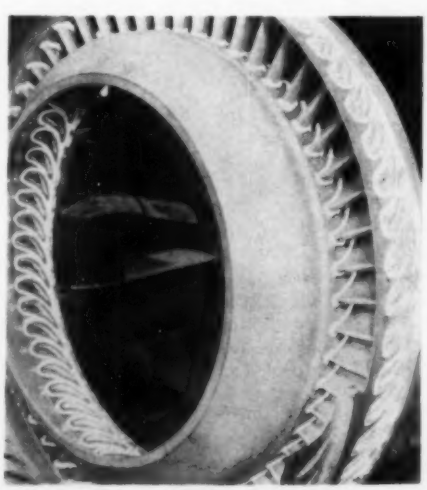
- Braze stock has ductility; as much as 5% elongation in tensile test at 700 F.
- Coefficients of expansions can be engineered to match base metals by proportioning the alloys.
- Braze material can be welded over without losing much in tensile strength.

Joints are brazed in low-dew-point hydrogen atmospheres without flux. Stopoff materials are added to the assemblies to control flow of the braze metal, and this may produce some stains; but base metals are otherwise unaffected. It is actually possible to do some heat-treating to the assembly if dissimilar metals in the unit allow suitable heating cycles.

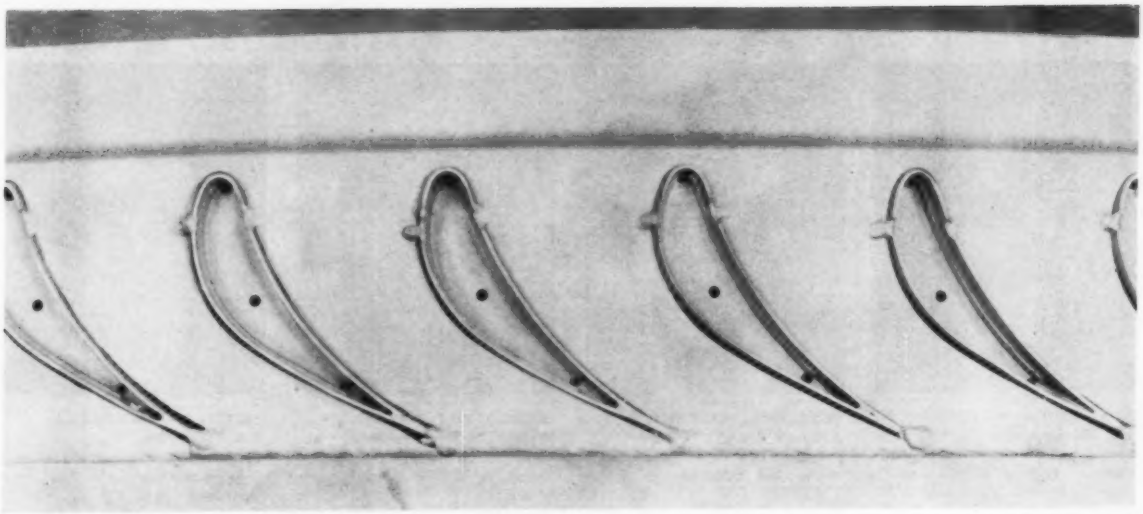
Assemblies completed include face-to-face and end joints, tube-and-fin assemblies, and a sample ribbed gear case for bearings that withstood 11 G's in tests. One of the important gains for the brazing material is that it allows low-weight assemblies that will stand punishment as well as much heavier units formerly produced.

Strength in the brazed joints is high. Ultimate strengths for a tube-and-fin assembly tested out to 65,000 psi at 700 F and 24,000 psi at 1500 F. Fatigue strength was 39,000 psi. Thus the alloys are really high-temperature brazing mixtures that will work with base alloys for such applications as jet engines.

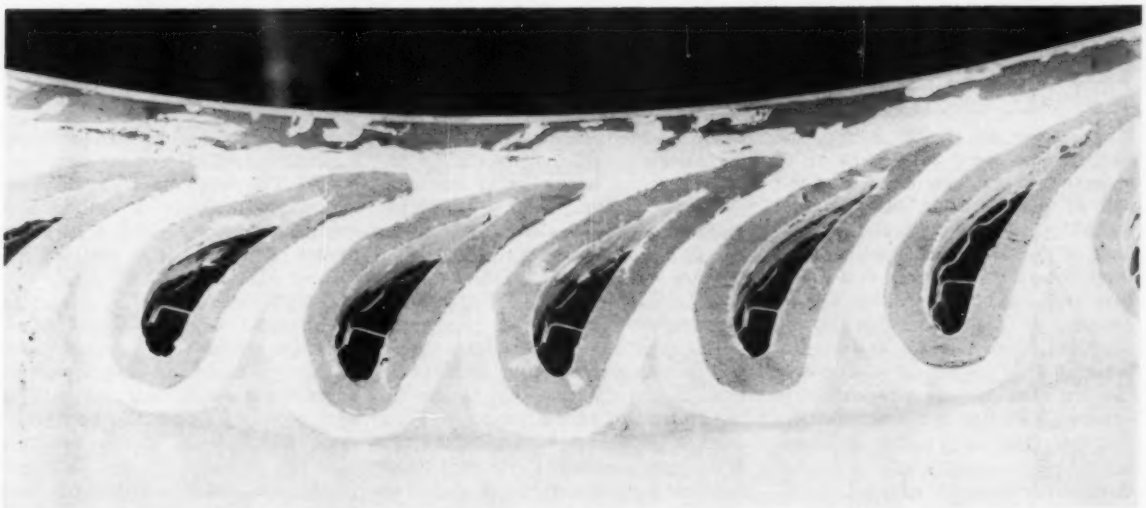
Brazing alloys are bing made in cobalt-base, nickel-base, and several other formulas.



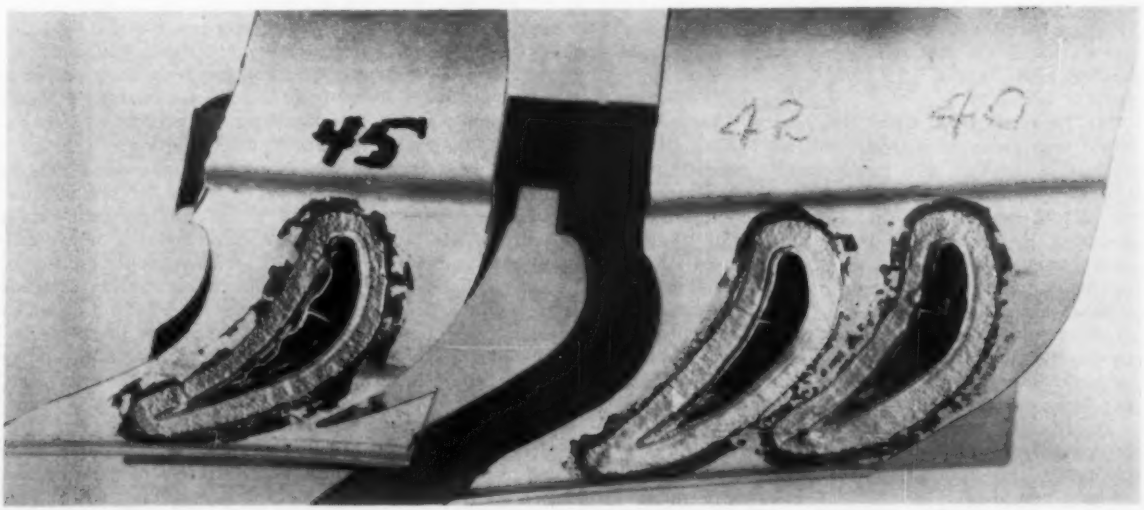
Jet-engine ring has been assembled, tack-welded, and brazing alloy and stopoff added. Unit is ready for furnace heat



Nozzle-diaphragm outer band is tack-welded to join vanes. Jet-engine assembly is cleaned and ready for brazing. Note gaps



Stopoff is added to control braze flow, and brazing alloy is laid in place. This is inner band of same unit



Test parts after brazing show solid joints in spite of gaps. Stains are from stopoff

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President
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Seattle

Stepup in machine tool engineering urged to keep U S ahead of world competition

Engineering in the U S machine tool industry must be stepped up to be sure that we remain ahead of the rest of the world in machine tool technology, Frank H Habicht, president of the American Machine Tool Distributors' Association, told members and guests at the 34th annual meeting of the association at the Sheraton Plaza Hotel in Boston October 16-17. This action is necessary "so we can compete adequately in export as well as home markets."

It will take some clever engineering into U S machines and into production methods, he stressed, to offset lower labor rates available to foreign machine tool builders. His inspection of Soviet-bloc machines at the Brussels Fair convinced Mr Habicht that the U S industry is in for a rude shock if it thinks that it has no real competition from iron curtain countries.

Mr Habicht urged upon the machine tool industry a fresh look at its selling methods and terminology and said that "we must cause machine tool replacement to be fashionable." He declared that the current "breathing spell" has been used by distributors to train new salesmen, to retrain old salesmen, to upgrade management practices, to improve distribution techniques, and to build their organizations for bigger business ahead.

Distributors increased their ratio of total new machine tool orders by 20% during the first eight months of 1958 compared with 1957, James C Kelley, association general manager, reported. He outlined a pending campaign by the association to attract young engineers to the machine tool industry, and to sales engineering in particular, as a career. He said that more than 1300 distributor salesmen have attended the industry's annual sales conferences through the years.

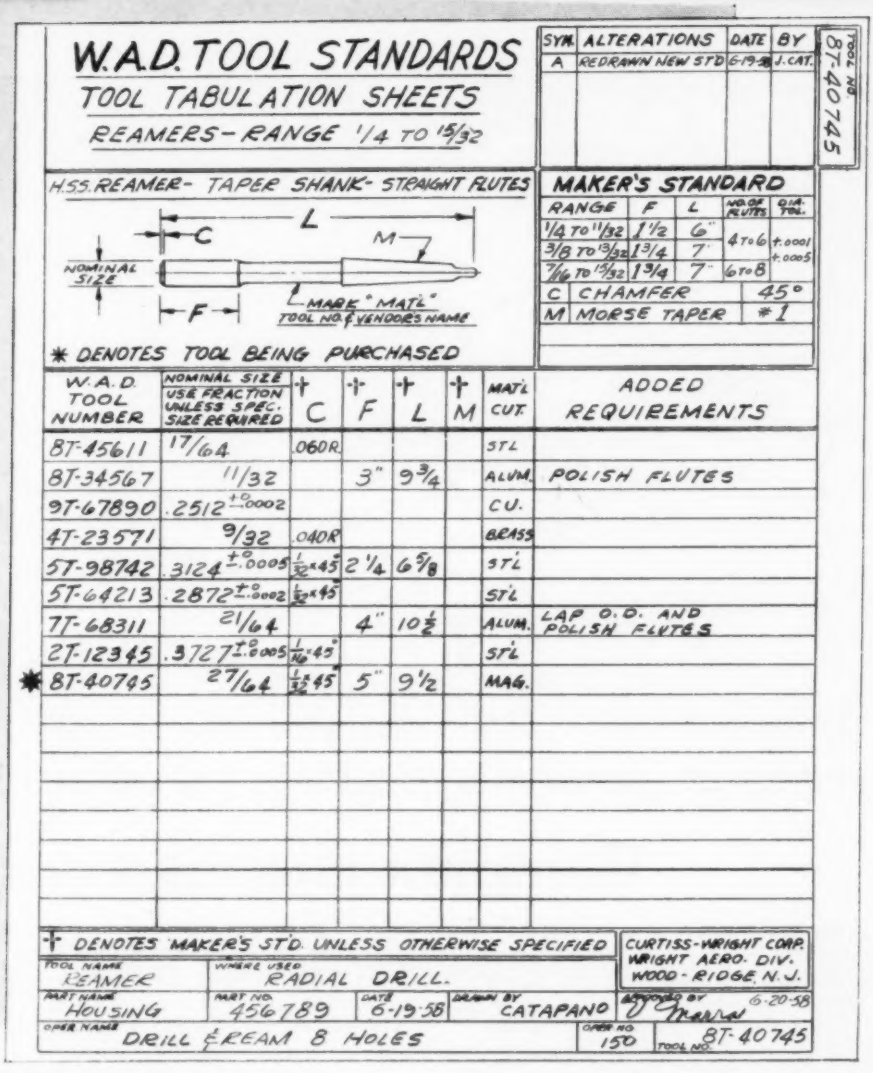
The government's unrealistic and unwise tax depreciation policy has been one of the principal factors in the slowdown of the economy, Joel Barlow, Covington and Burling, Washington, charged. He said that business cannot expand or even replace and modernize its facilities if there is little or no prospect of recouping its investment out of profits. Other industrial nations have adopted realistic depreciation policies and are moving ahead or are closing the gap between them and us, he commented.

Aside from bad tax depreciation policy, Mr Barlow believes that two other important problems hang over the machine tool industry: government surplus machines and importation of foreign machines. He accused metalworking managements of being afraid to adopt realistic depreciation because it would depress their profits. Too few managements have taken advantage of the sum-of-digits and double declining-balance systems of writing off investments, he said. Only 30% of machine tool builders have done so.

An insidious philosophy—that only manufacturing adds value to goods—has been building up, R W Nissen, chairman of the overhead expense research committee, reported. The fact must be made clear that "this business of selling and servicing a machine tool is part and parcel of the value as well as the cost of a machine tool."

Distributors make an important contribution to builders in the engineering area by feeding back changing customer requirements, engineering ideas and competitive developments, Ralph J Kraut, president Giddings & Lewis Machine Tool Co, declared. In the manufacturing area, distributors feed back new manufacturing techniques and constantly sell builders new items of plant machinery. In the financial area, they take credit and collection risks, work out rental and deferred payment deals with customers, and pay promptly their accounts to builders. He outlined eight main reasons why he prefers distributor selling to direct selling.

The Navy now possesses a 300-ton double-acting press for hot vacuum pressing of plastic bonded explosives, Admiral John T Hayward, vice chief of naval operations, revealed. He listed as the Navy's needs in the machine tool field: 1) greater extremes in large and small dimensions, 2) closer tolerances, 3) ability to handle more complex devices, 4) better quality and variety of surface finishes by mechanical and electrochemical processes, 5) ability to work larger variety of metallic and non-metallic materials with wide range of physical characteristics.



W.A.D. TOOL STANDARDS

TOOL TABULATION SHEETS

REAMERS – RANGE 1/4 TO 15/32

SYM.	ALTERATIONS	DATE	BY
A	REDRAWN NEW STD	6-19-58	J. CAT.

TOOL NO. BT-40745

HSS REAMER – TAPER SHANK – STRAIGHT FLUTES

MAKER'S STANDARD

RANGE	F	L	NO. OF FLUTES	DIA. TOL.
1/4 TO 11/32	1 1/2	6"	4 TO 6	+.0001 +.0005
3/8 TO 13/32	1 3/4	7"		
7/16 TO 15/32	1 3/4	7"	6 TO 8	

C	CHAMFER	45°
M	MORSE TAPER	#1

* DENOTES TOOL BEING PURCHASED

W.A.D. TOOL NUMBER	NOMINAL SIZE USE FRACTION UNLESS SPEC. SIZE REQUIRED	† C	† F	† L	† M	MATL CUT	ADDED REQUIREMENTS
BT-45611	17/64	.060R				STL	
BT-34567	11/32		3"	9 3/4		ALUM.	POLISH FLUTES
9T-67890	.2512 +.0002 -.0000					CU.	
4T-23571	9/32	.040R				BRASS	
5T-98742	.3124 ±.0005	1/32 x 45°	2 1/4	6 5/8		STL	
5T-64213	.2872 ±.0002	1/32 x 45°				STL	
7T-68311	21/64		4"	10 1/2		ALUM.	LAP O.D. AND POLISH FLUTES
2T-12345	.3727 ±.0005	1/16 x 45°				STL	
* BT-40745	27/64	1/32 x 45°	5"	9 1/2		MAG.	

† DENOTES MAKER'S STD. UNLESS OTHERWISE SPECIFIED

CURTISS-WRIGHT CORP. WRIGHT AERO. DIV. WOOD-RIDGE, N.J.

TOOL NAME	WHERE USED			
REAMER	RADIAL DRILL			
PART NAME	PART NO.	DATE	DRAWN BY	APPROVED BY
HOUSING	456789	6-19-58	CATAPANO	6-20-58
OPER. NAME		OPER. NO.	TOOL NO.	
DRILL & REAM 8 HOLES		150	BT-40745	

Tabulation tool sheet lists all purchases . . . for a family of similar special tools. Sketch and box show common dimensions. Special data is entered on one line for each new tool. Prints from this "Van Dyke" go with the purchase order. The "Van Dyke" is printed from the master and has the same data except for the asterisk and the detailed notes in the title box.

Tool Tabulation Sheets Shortcut Special-Tool Drawings

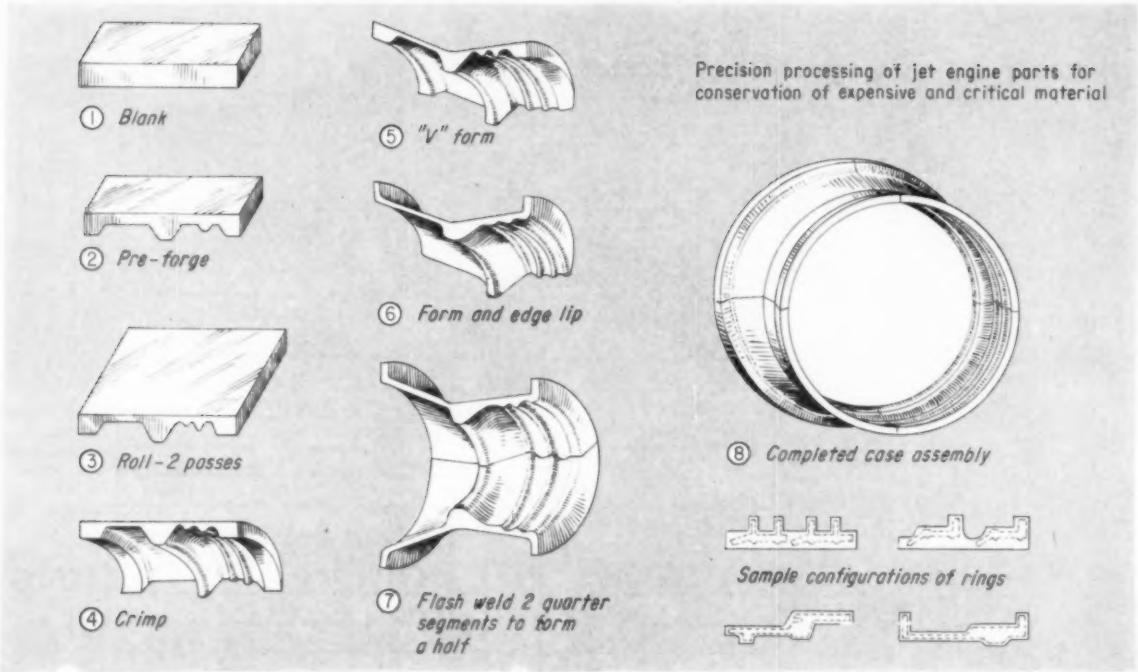
By **David C Kauffman,** methods development engineer, Wright Aeronautical Div, Curtiss-Wright Corp, Wood-Ridge, N J

Many hours of engineering and drafting time are saved by a streamlined technique for ordering special cutting tools such as drills, reamers, etc, at Curtiss-Wright. Common practice calls for a complete special tool drawing each time a tool is to be ordered. Now our Tool Tabulation Sheets serve the same purpose—and more—at much lower cost.

A special tool is ordered by pulling a "family" master tool list from the file and checking this list for existing tools that might do the job. If none is available, we add a single line of specific details about the new tool to the Master Sheet. A transparent "Van Dyke" copy of the master is made, and the title box at the bottom of the sheet is filled in with the necessary information. Finally, blueprint copies of the "Van Dyke" are made and sent out for bids.

This tool tabulation sheet therefore substitutes for any number of special tool drawings with information and dimensions common to all the family of special tools listed. As each new tool is required, a new line of data that includes all special dimensions is added to the master. This covers complete information on all special tools of the same general type. Cases of duplicate tools are sharply reduced, and inventory data on special tools are readily available.

Standard tool dimensions such as flute lengths, overall lengths, diameters, and tolerances are listed in a box on the master; only required exceptions are noted on the line for the new tool being ordered. These special tools therefore tend to conform to industry standards. This practice reduces the cost of these tools.


Precision processing of jet engine parts for conservation of expensive and critical material
① Blank
② Pre-forge
③ Roll-2 passes
④ Crimp
⑤ "V" form
⑥ Form and edge lip
⑦ Flash weld 2 quarter segments to form a half
⑧ Completed case assembly
Sample configurations of rings

Jet-engine turbine case is contour-rolled in four identical sections that are welded together. Other parts can be made by combining sections after rolling and bending; for example, shaped hollow struts and turbine blades

Complex shapes are contour

A O Smith process (not proprietary) hot forges integral ribs into heavy plates to hold close tolerances and avoid difficult machining in aircraft metals.

Technique can handle varying stock thicknesses, stiffeners in many directions, and works with all structural metals

By F J Altmann, engineering manager and R D Libert, manufacturing manager
A O Smith Corp. Aeronautical Div, Milwaukee

Contour rolling combines forging, extruding, and rolling to shape high-strength contoured parts to close dimensions without loss of expensive materials. Titanium, aluminum, and stainless alloys are being formed to near final dimensions in flat-bed dies that produce deep integral ribs and stiffeners for such parts as jet-engine rings, steam-turbine blades, and compressor cases. Complex parts can be formed this way to exact section thicknesses at all points, eliminating excess material in the product.

The process applies downward roll pressure against rectangular heated blanks loaded over formed dies on the bed of a rolling press. The flat-bed dies allow positive metal control, which is impossible with two-roll forming. Most often a part is contoured on the bottom, where it meets the die, and remains flat on top where the roll acts. But in some cases both sides of the part can be contoured if a shaped roll is installed.

Close control of the metal in the die allows precalculations of die dimensions and blank size so the metal is distributed, thinned, and elongated to accurately fill the die cavities, leaving little excess stock for trimming on sides and ends. Roll down-feed is controlled by hardened "spanks"—bars—on each side of the die.

One typical product is integrally stiffened aircraft skins, contoured from 0.125-in. plates that are rolled to produce a skin 0.05 in. thick with close-spaced ribs 0.125-in. high.

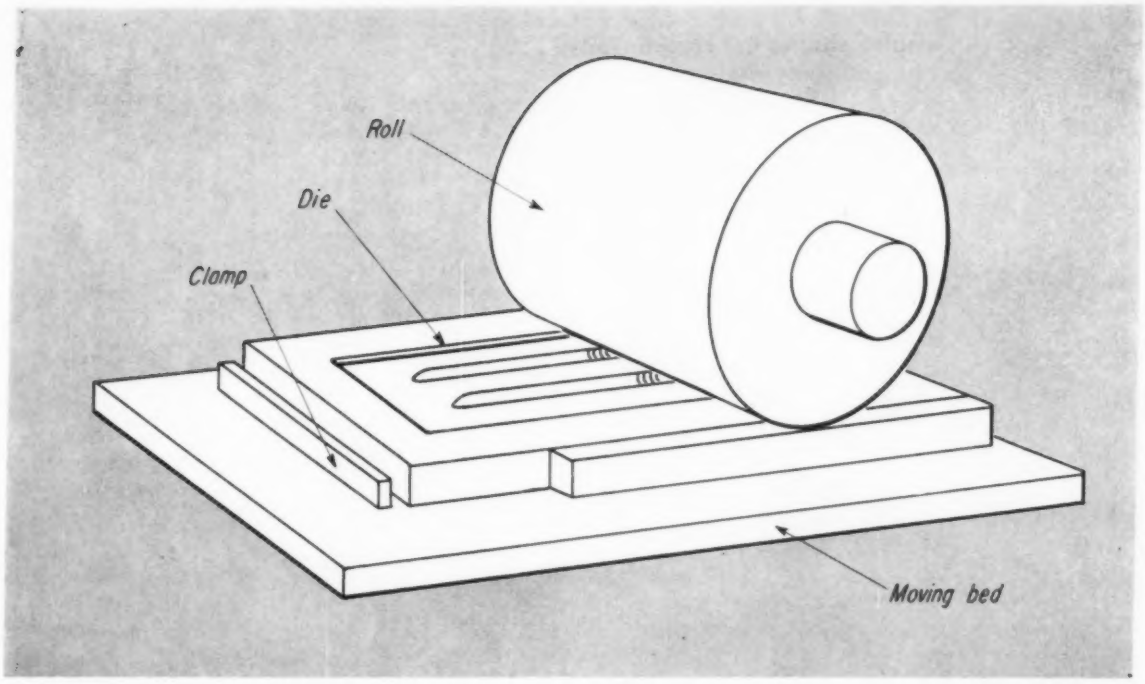
Machining Reduced

Complex contoured parts, such as aircraft landing-gear strut members, can be built up from contoured elements welded together.

Final dimensions can often be met without subsequent machining, and it may only be necessary to grind off excess weld metal. Thickness tolerances possible with the technique vary from +0.013 −0.005 in. on sheets 0.05 in. thick to ±0.010 on plates 0.5 in. and thicker.

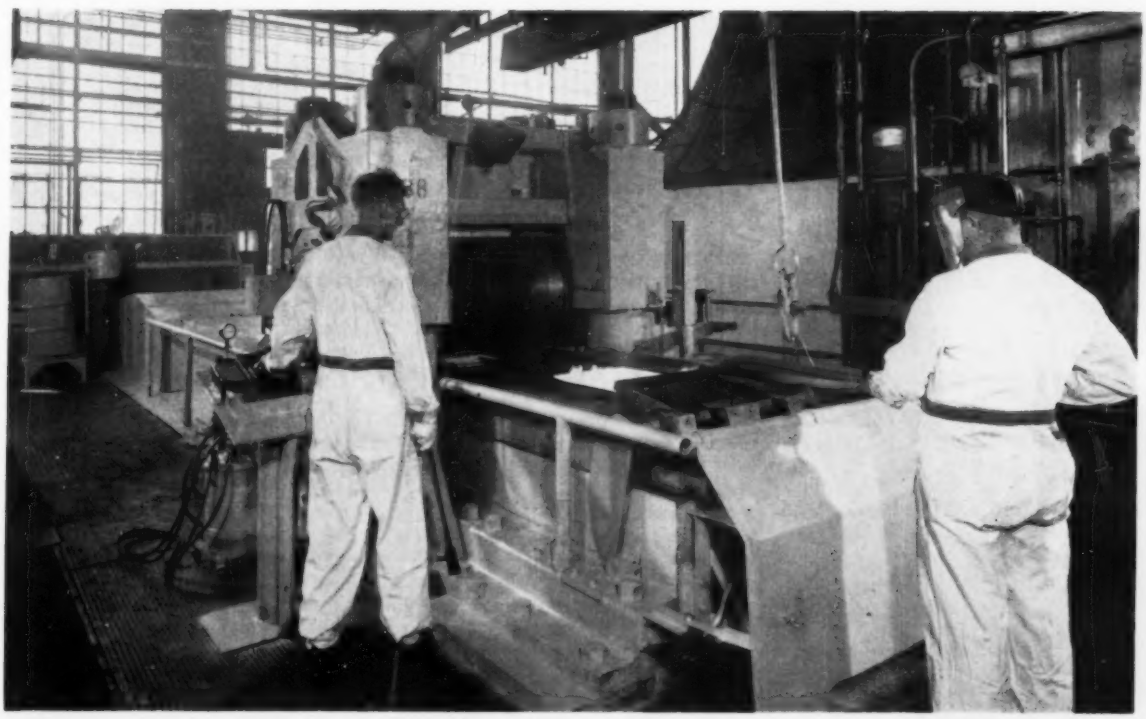
Capacity of the existing press is

Final machining removes weld beads and produces exact contour required on turbine base



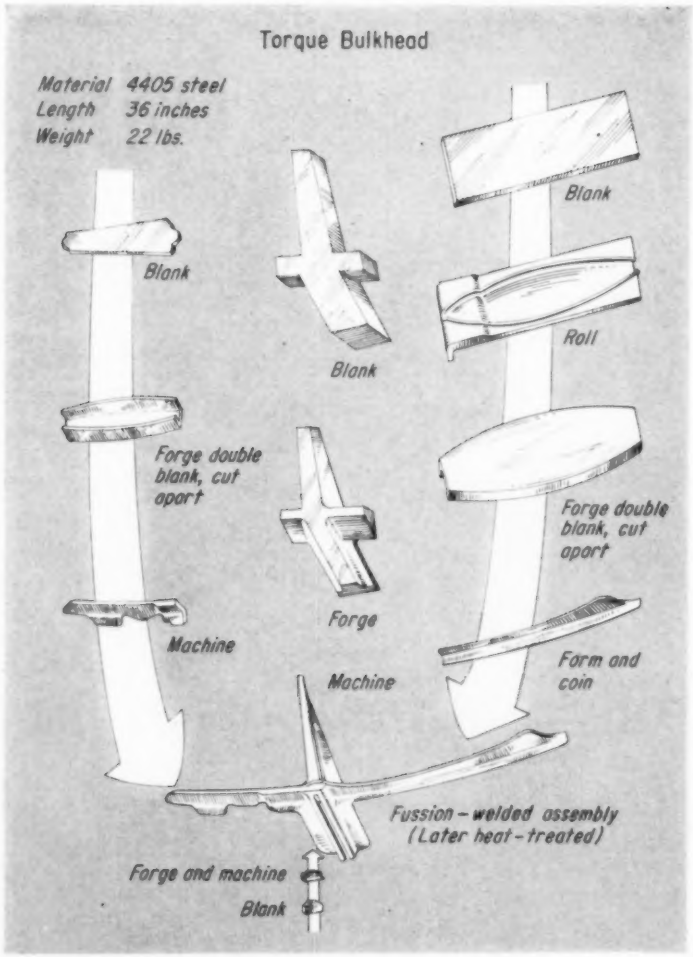
Heavy roll pressure forges heated stock into die on reciprocating table. Roll may be contoured if both sides of stock are to be shaped. Aluminum sheets with as many as 18 separate ribs of different shapes have been rolled

rolled in expensive materials



1800-ton mill has 6-ft stroke, bed of 180 fpm. Die lubricant is powdered graphite mixed with kerosene, water, or oil

Complex shapes are contour rolled . . .



Torque bulkhead supports engine in B-52. Segments are contour-rolled, then welded together. Final machining is light

1800 tons, which can be applied to work up to 30 in. wide and 72 in. long at 180 fpm. Section thicknesses up to 0.05 in. can be handled, and the press will work panels up to 2 in. thick maximum. When severe contours are to be formed, several intermediate work heatings and preparatory rolling and forging operations may be required.

Die material is usually a hot-work die steel for tough applications, or SAE 4340 or 1045 for short runs. Dies are maintained at 300-400F in the mill, and are lubricated with graphite and oil.

Extruding Action

Two general kinds of action are possible. If deep ribs are to be formed, rolling and forging may be combined with extrusion to forge up ribs higher than the original thickness of the stock, although the roots between ribs must be lower than the original section thickness. When all of the final contour is no higher than the original stock thickness, only rolling action is required to fill out the contour of the work. Extrusion requires more power, which means any machine is limited in the height of integral rib that can be extruded. In either case the panel is lengthened about 25% during rolling, for which extra stock must be calculated and included in the original piece. Maximum reduction of thickness is about 60-70% per pass, depending on material.

Power demand for inconel, titanium, and superalloys is about 1.23 times that for steel and stainless steel.

Heat program timer controls rate of heat input to weld

Slope control makes better welds...

. . . by conditioning the work both before and after welding current is applied. During the up-slope period, the surface is prepared by increasing the heat gradually. During down-slope, the weld is annealed

By John Kelly, welding engineer,
Applications Lab, Raytheon Manufacturing Co, Waltham, Mass

The quality of a resistance weld depends largely upon the amount of welding heat applied. If the workpieces are not hot enough, they do not stick together; if they are overheated, they are burned and otherwise injured.

Another problem is presented by metals with a high-resistance coating or oxide. If heat is applied too rapidly to such materials, the surface reaches the optimum temperature while the interior is still cool, causing a defective weld. On the other hand, if enough heat is applied to weld the base materials, the coatings or oxides become overheated and cause poor welds and spatter. Therefore, the *rate* of heat input is also very important.

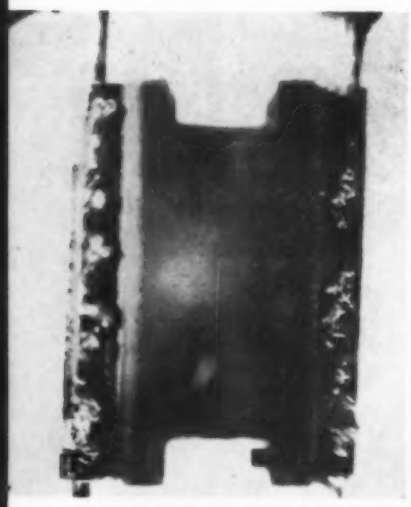
Early programming units, developed primarily for heavy-duty work, were bulky and expensive, and their timing and current controls could not be adjusted independently.

Also developed were small welding units with sufficient precision to give satisfactory performance in clockmaking and similar assembly operations. However, as there was no provision for programming, the high peak currents and short application time of these units produced splashes and other inconsistencies on carbonized materials and other metals with high-resistance coatings.

At this point, Raytheon Manufacturing Co, which was already producing these small, relatively precise units, was called upon by the Government to mass produce "reliable" subminiature tubes for missiles and other military devices—tubes which had to meet standards of reliability never attained in commercial practice.

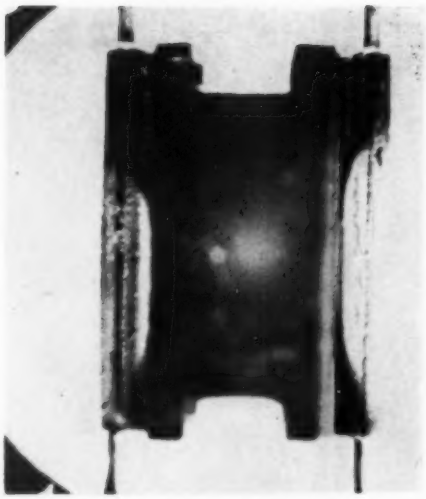
Neither the company's own small units nor those of any other make provided enough flexibility and control to suit the "production-module" assembly technique required to turn out super-reliable subminiature tubes in quantity. And the large pro-

Slope control makes better welds . . .



1 . . Weak, splashed weld . . . produced by normal welding techniques. Much of the current was lost at the surface

2 . . Maximum-strength weld . . . with conventional techniques. Sides are completely burned through because of high current setting



3 . . Slope-controlled weld . . . is relatively clean and strong. Current was the same as in Fig. 2, but its application was controlled

grammed units were equally unsuitable.

Raytheon was therefore forced to develop a programming unit as well as power units and welding heads that would offer all the advantages of existing equipment plus a new degree of refinement.

Slope control

Heart of the new system is the programming unit, called the heat program timer. This unit controls the "slope" of the welding current in three periods, over a maximum time range of 30 cycles, in the following manner:

1. During the up-slope, or surface-conditioning, period, the current gradually increases. Duration and maximum current attained can be pre-set independently to produce any desired slope.

2. During the welding period, which corresponds to conventional weld time, the current remains constant at the maximum level of the conditioning period. Weld duration can be pre-set over a range of 2 to 10 cycles.

3. During the down-slope, or annealing, period, the current gradually decreases. Again, duration can be pre-set over a range of 2 to 10 cycles.

The annealing phase is particularly useful for welds made between metals undergoing severe bending or deformation. The heat-affected zone usually surrounding a welded area can thus be reduced, leaving a more ductile grain structure in an area where brittleness would be most harmful.

The heat program timer must be employed with a thyratron contactor unit from which it takes its power. This unit serves as an electronic switch which regulates the magnitude and duration of the ac welding current as dictated by the timer.

Welds "dirty" metals

The slope control has solved a major production problem in the "reliable" tube industry by enabling "dirty" materials to be welded without producing splash or other surface defects. A splashed weld particle precariously clinging to a welded area offers a continuous threat to tube operation. Consequently, it used to be necessary to clean the tube parts before or after welding—a slow and uncertain process.

The splashes characteristic of normally welded carbonized surfaces can be seen in Fig. 1. Here we have a typical tube plate consisting of two carbonized nickel-plate halves welded together, with two nickel side rods sandwiched between the halves. Besides being splashed, such welds are usually weak, because a relatively large portion of the allocated current is dissipated in heat at the surface. They are even weaker when production personnel try to reduce the splash by reducing the current.

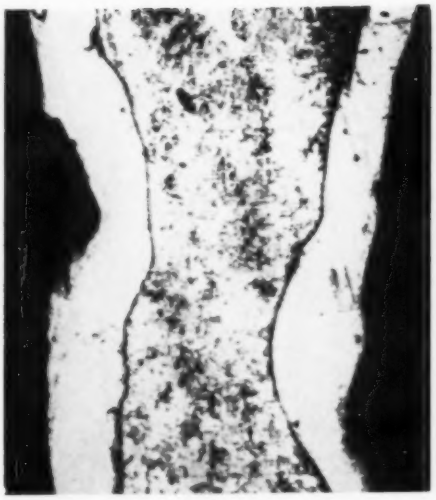
When the current magnitude is raised to the proper value for maximum weld strength, disregarding the splashing effect, we have the results shown in Fig. 2. The sides are completely burned through as a result of the high current impressed across the high-resistance interface.

However, the same plate type, this time welded with the slope control, produced the results in Fig. 3. Current magnitude was the same as for Fig. 2, but its application was controlled. The relatively clean surface is typical of welds made in this way.

A microetching of the cross-section of a weld made with a conventional timer, clearly indicates the absence of any significant fusion (Fig. 4). The carbon layer on both surfaces has remained unaffected. The excessive electrode indentations, plus the craters on the surface indicating origins of splashed weld particles, are the only evidence that a weld has ever been attempted.

In the weld made with the slope control (microetching, Fig. 5), the carbon layer has been disturbed and has diffused into the nickel, while considerable fusion has occurred along the interface.

The initial current magnitude across the interface is low enough to produce less heat in spite of the high initial resistance. As the carbon or



4 . . No significant fusion . . . is shown in this microetching across a weld made with conventional timer. The carbon layer on both surfaces is unaffected

5 . . Carbon has diffused into nickel . . . and considerable fusion has occurred at interface in this microetching across a slope-controlled weld

6 . . Copper-to-copper weld . . . with slope control. Microetching indicates a ductile weld attributable to annealing effect of down-slope period

"dirt" layer becomes soft and is mechanically removed by the continuously applied force, more metal-to-metal contact is obtained. Full current is reached later, after a better contact has been achieved.

Typical control settings for welding an electron tube plate subassembly would be: up-slope, 10 cycles; weld time, 10 cycles; down-slope time, 2 cycles. The values for current would be: low heat, off; high heat, 8. "Low heat, off" means that the up-slope current starts at zero, a desirable condition for this application. Initial current must be kept low because of the high resistance of the electrode-to-work interface.

More design freedom

Another advantage of controlled welding is that fewer compromises have to be made in the selection of materials and coatings and in the design of structures. Welds between highly conductive materials such as copper-to-copper would normally require a high-resistance metal interlay or simply high-resistance electrodes to apply a self-generated heat. With slope control, however, they are made as easily as nickel-to-nickel welds or welds of any other material whose resistance permits normal resistance welding.

By the gradual application of current, the metal can be preheated to raise its resistivity before the normal welding current is applied. In the case of copper, the resistivity approaches that of nickel just before welding current magnitudes are reached.

Fig. 6 shows a microetching of a copper-to-copper weld. The nugget shows uniform grain growth with relatively little difference in grain size from that of the surrounding area, indicating a fairly ductile weld. Again, the annealing action of the down-slope period is responsible for this ductility.

Less tip maintenance

It has also been determined that the slope control function greatly extends electrode life and reduces electrode maintenance. Electrodes must maintain constant contact with the workpieces to conduct the current and must do so with sufficient force to forge the molten metal into a weld nugget.

In conventional welding, initial high peak currents are applied which require high electrode pressure to prevent splashing, burning, and blowout, for the tip of the electrode must conduct maximum current before seating itself in the melting metal. This high pressure results in frequent electrode maintenance.

With programmed welding however, the metals (aluminum especially) melt and soften at the workpiece-to-electrode interface at a predetermined rate and allow the electrodes to seat themselves properly before welding currents are applied.

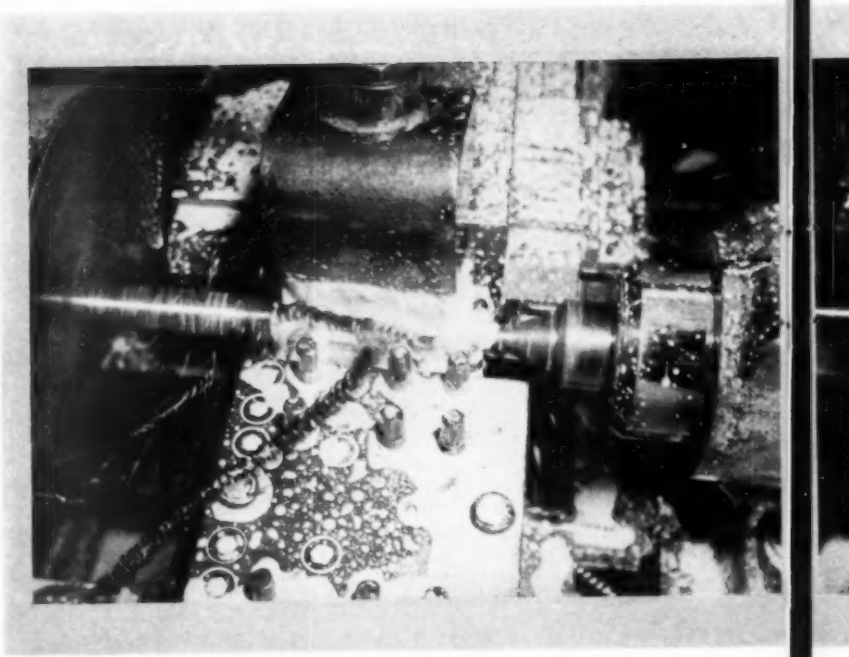
The greatest value of the heat program timer lies in precision applications (mainly in the fields of electronic and electrical parts fabrication) where weld quality is important and optimum surface conditions cannot be maintained; where metals are known to be coated and cannot be cleaned for practical reasons; where metals having high conductivity are to be joined; and where welding has not even been considered because of the limitations of previous techniques and equipment.

Poor welds have been practically eliminated in Raytheon subminiature tubes through adoption of an integrated welding system comprising:

1. A simple, rugged, compact welding head, accurately adjustable and specifically designed for subminiature tube welds.

2. A synchronous heat program timer which conditions the work before the weld is made and anneals the work afterward. Welds of excellent reliability are consequently obtained even with materials normally difficult to weld, such as aluminum, tantalum, and dumet.

3. An inert gas curtain, supplied through specially designed hollow electrode holders, which shields the weld and prevents the formation of harmful oxides.



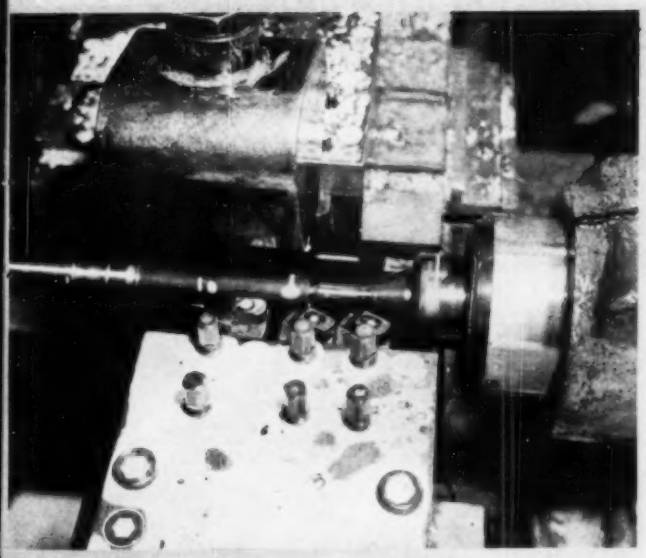
Tool life went up ten times when square oxide bits and more rigid toolholders replaced triangular carbides in conventional clamp holders. Worm shaft is turned at original speeds and feeds—250 sfpm and 0.008 ipr. Coolant is 25:1 emulsion; cable chips are about ½ in. in dia

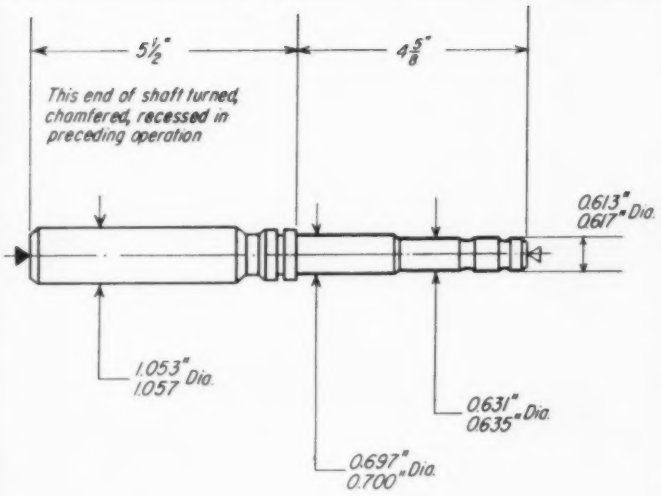
Cutting speeds raised...
Tool life extended...
Quality control improved...as

Chrysler machines

Cratering and Wear of Cemented Oxide Bits When Turning Pearlitic Malleable-Iron Castings

	Bit 1	Bit 2	Bit 3	Bit 4
Cutting Speed—fpm	233	426	798	1007
Feed per Revolution—ipr	0.0095	0.0095	0.0095	0.0095
Depth of Cut—in.	0.100	0.100	0.100	0.100
Power Used—Watts	2100	3400	6200	8700
Condition of cutting edge after turning 10 pc:				
Depth of Crater—in.	None	None	None	0.0002
Width of Wear Land—in.	0.003	0.003	0.004	0.006
Condition of cutting edge after turning 20 pc:				
Depth of Crater—in.	None	None	None	0.0003
Width of Wear Land—in.	0.005	0.003	0.004	0.009
Condition of cutting edge after turning 30 pc:				
Depth of Crater—in.	None	None	None	0.0004
Width of Wear Land—in.	0.005	0.004	0.003	0.011
Condition of cutting edge after turning 40 pc:				
Depth of Crater—in.	None	None	None	0.0004
Width of Wear Land—in.	0.006	0.004	0.005	0.013
Condition of cutting edge after turning 50 pc:				
Depth of Crater—in.	None	Trace	0.0001	0.0006
Width of Wear Land—in.	0.008 to 0.011	0.004	0.005	0.015





Three diameters are machined as Sundstrand stub-lathe front slide plunges to depth in worm shaft, then feeds left. First tool must cut to shoulder. Tools on rear block cut grooves and chamfer in stem end

with job-tested oxides

By Ben C Brosheer, associate editor

Only successfully tooled jobs are turned over to production operators at Chrysler's Indianapolis plant, which explains, in part, why cemented-oxide cutting tools have been applied slowly to power-steering and automatic-transmission components. But there are now about a dozen jobs permanently converted to oxides, and applications are being added at about one a month. Each case must show clear advantages for the new cutting materials.

Some cutting speeds have been doubled or more; but others have increased only slightly or not at all. Tests and current experience show that the high cutting speeds possible with oxides are not necessarily always the most economical. But major economies have resulted from increased tool life, particularly because shutdowns for tool adjustment and replacement have been sharply reduced. Oxide tools have been justified in many cases because of improved control over product quality, higher accuracy because tools wear slower, and higher quality in work surface finish.

Laboratory tests have been in progress since 1955, with tool engineers carrying on tool-development studies away from balanced production lines, where possible failures might cause unexpected work stoppages. Each proposed oxide application has been studied carefully to make sure the tools and work will be supported rigidly. Special toolholders have been developed. Machine tools have been put in first-class condition, and larger motors have been installed to insure adequate power for the cuts to be taken.

Most applications have been made with Stupalox cemented-oxide bits. An experienced Carborundum field engineer made detailed studies of each proposed new setup, and assisted Chrysler tool engineers over a period of several months. Successful oxide jobs to date include turning cold-drawn steel shafts, and turning, boring, and chamfering pearlitic malleable-iron and shell-molded CI castings.

Steel turned at carbide speeds

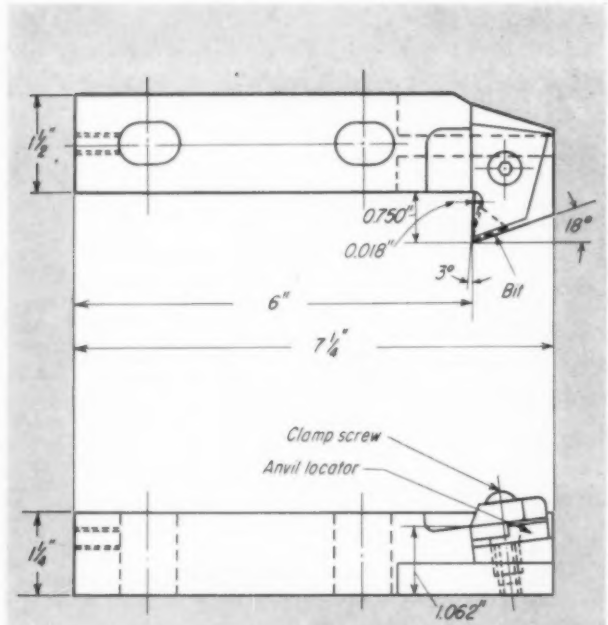
Small worm shafts for "Constant-Control" power-steering units are turned from AISI 4027 steel by oxides that show ten times the normal wear life of carbides. Square oxide bits replace Grade C-6 triangular carbide bits, and operate at the same speeds and feeds. The oxides turn three stepped diameters at one end of the shaft after a worm at the other end has been turned at a similar setup on an adjacent automatic lathe. Oxide tools also groove and chamfer the shaft.

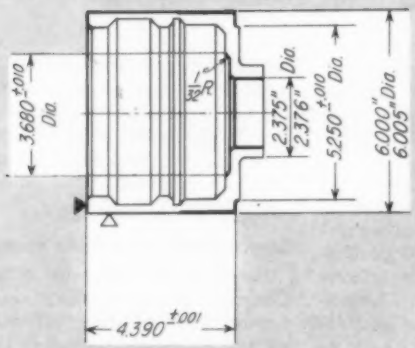
Originally three ⅜-in. carbide throwaway bits were held in stand-

Notes: Tests were run late in 1955 with Stupalox oxide bits clamped in a double-negative holder on a standard No. 4 Warner & Swasey turret lathe. Rake angles were both −3°, and front and side clearances were 4°. Test pieces were piston-retainer castings previously rough-turned to 6¼ in. OD. The work had a hardness range of 180-229 Bhn.

Dry cuts without chipbreakers were made for lengths of 2¼ in. Feed rate and depth of cut were constant; only the surface speed was changed. One point on each of the four bits was used, and none failed after 50 pc—and visual examination showed that they could have cut more.

Edge wear, width of wear land, and crater depth were measured after each run of 10 pc, and 15X microphotographs were taken. Under test conditions, edge wear developed more rapidly at the high and low speeds, but cratering was a problem only at the high speed. A speed of 800 sfpm is close to the most economic for the conditions during the test. Improvements in the oxide bits since the tests have increased the economic speed ranges considerably.





Chrysler machines with job-tested oxides

Special angular holders set up oxide tools on New Britain boring machine that turns, bores, backfaces, and chamfers cast planet pinion-carrier housings. Double setups have two toolholders each, one for outside surfaces, and one for internal surfaces, which are completed after table shifts. Bore finish is 50 mu-in. or better. Tool has 18° side cutting-edge angle, 102° end cutting-edge angle, –5° rakes, and 5° clearances

ard toolholders to cut the three stepped diameters. One tool finished square against a shoulder, while the other two tools were set at a 15° lead angle. All tools used side and back rake angles of –7° and edge-clearance angles of 7°. The carbides averaged 40 workpieces per cutting edge, primarily because the lead bit wore rapidly, setting up vibrations that broke down the other tools faster than normal.

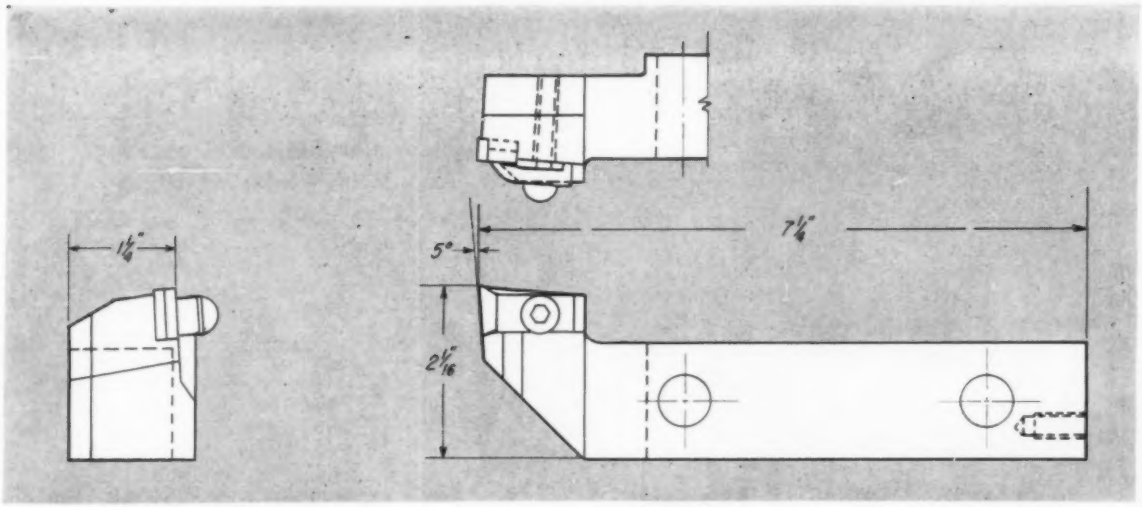
Improvements were made in three stages. First, the shoulder-cutting carbide bit was replaced by an identical triangular oxide bit. This boosted tool life to 500 pc/cutting edge, and raised life for the two other tools to 250 pc/edge because of reduced vibration.

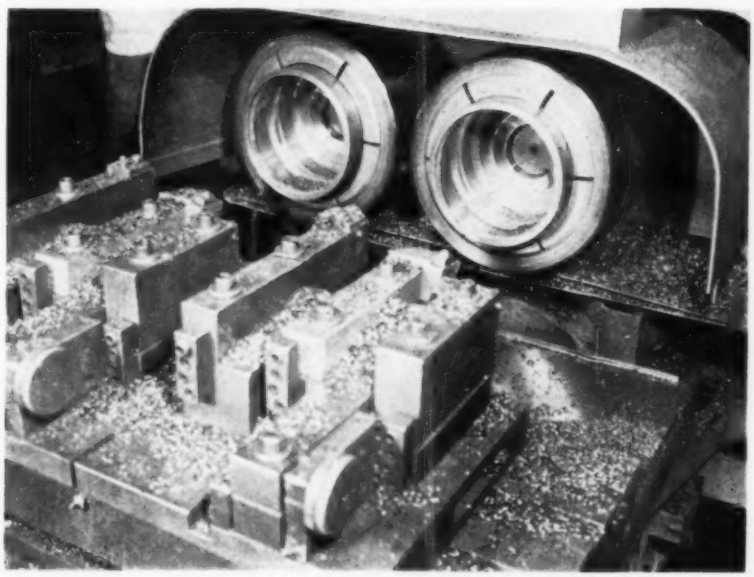
Next, a more rigid toolholder designed for an oxide bit ½ in. sq, 3/16 in. thick, and with 1/16-in. corner radii was installed to take the first cut. This held the tool at a 30° lead angle and provided –5° rake and 5° clearance. Tool life jumped to 750 pc/cutting edge, with the other two tools unaffected.

Finally, all three holders were replaced by standard Stupalox holders with low overhang. Oxide tools raised the life of the two following tools to 350-400 pc/cutting edge. No bits cracked because of the coolant applied. Bits were repositioned after cutting-edge wear lands grew to 0.015 in.

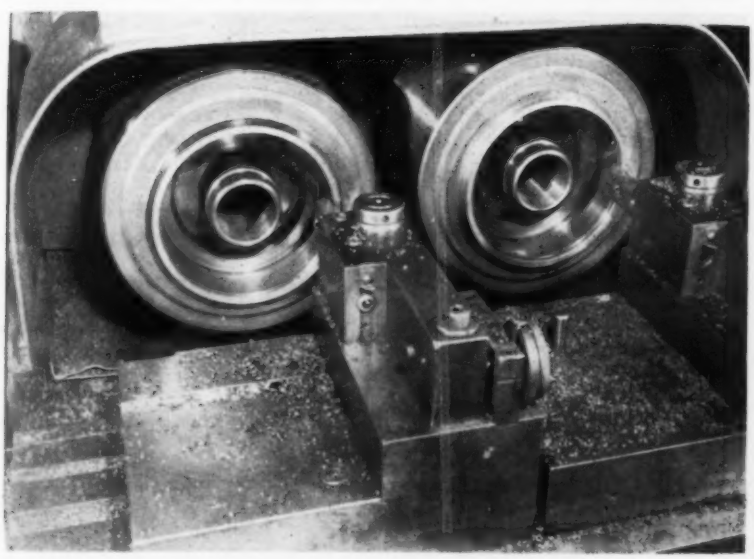
Rigid setups machine castings

Tool life was increased with higher cutting speeds when oxide bits were applied to Heald, Ex-Cell-O, and New Britain precision boring machines that work on malleable-iron and shell-molded iron castings for "Power-Flite" automatic transmissions. Actually, carbides were retained for some of the cutting on malleable-iron planet pinion-carrier housings. Carbides finish-turn and face the ends at 287 sfpm, with 0.0086-ipr feed and 0.02-in. depth of cut, because a relatively rough fin-

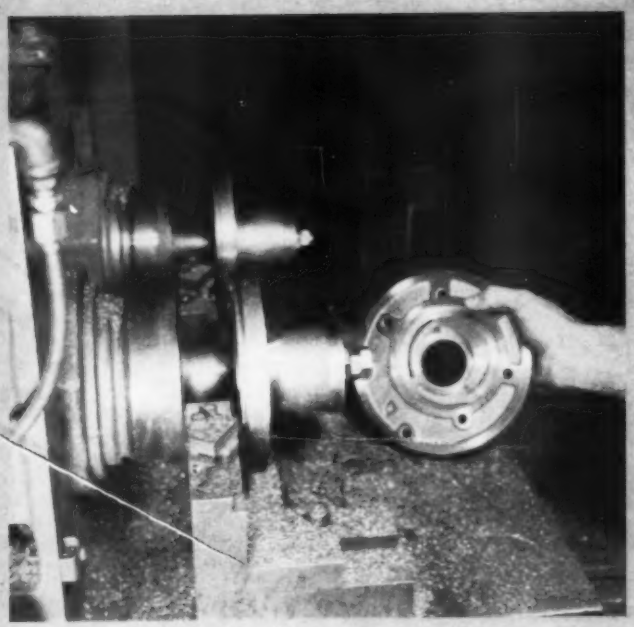


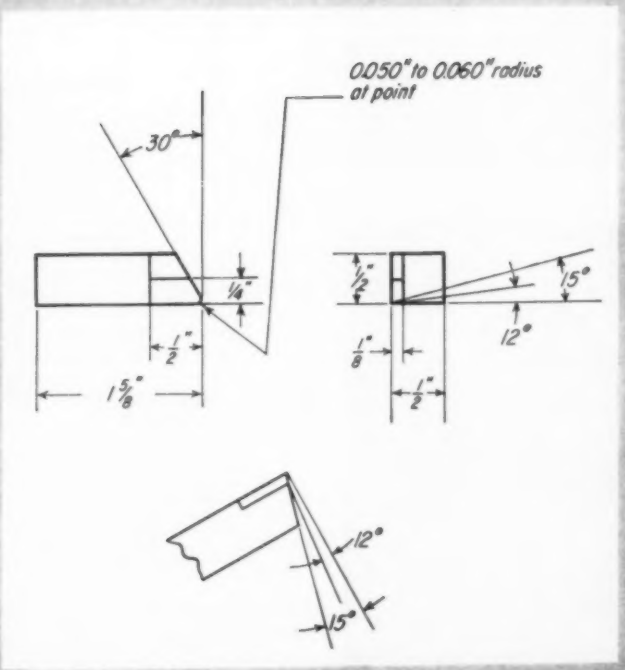


Tool resharpening was reduced and tool life was extended from 300 to 1200 pc/bit with oxides in special Valenite holders. This operation is on skirt ends of planet pinion-carrier housings, where clamped tools replace brazed bits. Tool removes 0.43 cu in. of stock/min. Side cutting-edge angle is 5°, end cutting-edge angle is 25°, rakes are –5°, and clearances are 5°



Cutting speed was increased from 330 sfpm to 1500 sfpm on malleable-iron clutch piston retainers when oxides replaced carbides on a New Britain boring machine. Tool life was increased 50%. Boring is done at 1030 rpm with 0.016 ipr and 0.015 in. depth of cut





Chrysler machines with job-tested oxides . . .

ish—100 mu in. or so—is required.

While the carbides machine the outside, boring, chamfering, and backfacing oxides enter the bores; then when turning is completed, the machine table moves over to clear the turning tools and engage the boring tools. At the same time the 3-hp two-speed motor that drives the twin spindles is reconnected to turn the work at 480 rpm.

Originally carbide bits were brazed to 3/8-in. shanks to fit angular holders to make the combined inside cuts. Angles were 40° for side cutting-edge angle, 80° for end cutting-edge angle, 0 back and side rake, and 7° front and side clearance, with a 1/32-in. nose radius. The backfacing cut started at 459 sfpm, and boring was done at 297 sfpm—feed and depth of cut the same as the outside tools.

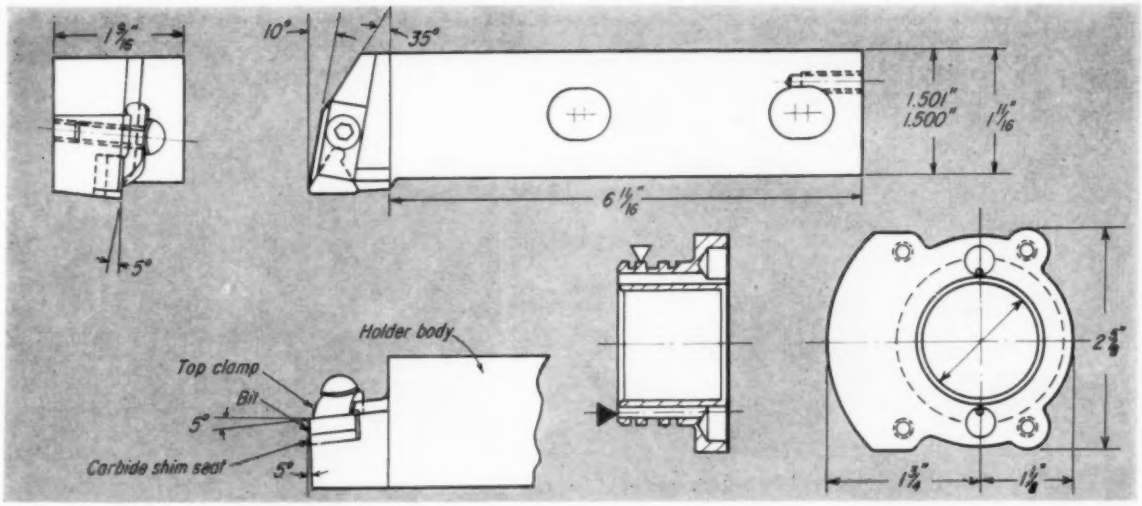
But the bits lasted only for an average of 69 pc/sharpening. When special Wesson angular clamping holders were installed with Stupalox 3/8-in. triangular bits, tool life jumped to 1200 pc/cutting edge or 72 pc/tool. No change was made in speeds or feeds.

Oxides for interrupted cuts

Two current jobs prove that oxides will take high impact when tooled up properly. One is an oil-pump housing plate of pearlitic malleable iron that requires facing. Flatness is required within 0.0005 in. tir, which was difficult to hold with carbides because of rapid tool wear. But oxides now hold the flatness to 0.0002 in. or better, at the same time showing higher tool life. Tools are ½-in. oxide bits factory-bonded to 1095 steel shanks with epoxy resin. Cuts are 0.007 in. deep and 3½ in. long. Speed is 550 sfpm.

Another job is shell-molded governor supports, on which eccentric flanges must be faced. The flanges

Tool life jumped from 25 ppg (pc/grind) to 190 ppg when oxides replaced carbides at two spindles where malleable-iron pump plates are finish-faced. Flatness to 0.0005 in. is required to seal oil. Tool has 30° angle on front face to produce zero lead when mounted in 30° holder. Tools are bonded to shanks with epoxy resins, which fail no more often than carbide brazes



Oxides make interrupted cuts on shell-molded grey-iron supports for automatic-transmission governors. Work is pierced by drilled holes, and flanges have eccentric shapes. Oxide tools have increased tool life three times over carbides. Tool shown is for facing; has zero lead, —5° rake, and 5° clearances. Job runs on a New Britain No. 37 Cam-Nu-Matic

are broken up by drilled holes, and the facing tool must withstand a high number of interruptions. Casting hardness ranges from 170 to 217 Bhn. The parts are faced and bored on a New Britain Cam-Nu-Matic with a spindle speed of 1050 rpm.

The boring bits held up, but the facing bits wore too rapidly. These were both replaced by Stupalox 3/8-in. oxide triangular bits clamped in special Valenite holders.

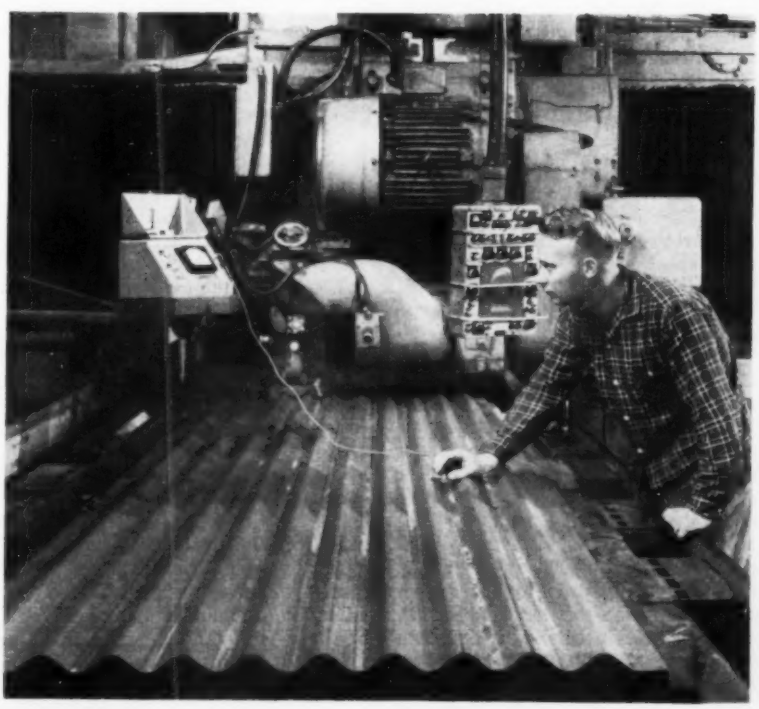
Both of these parts are now being machined at considerably less cost than was previously possible. Parts are produced with more consistent accuracy because lower tool wear means finishing to tolerances over a longer period of working time. And tool changes and adjustments are greatly reduced. Results on these and other job-tested parts indicate that oxide tools can increase production, reduce defects, and cut lost time.

Surface indicator teams with huge die grinder

Precision plates as long as 150 in. and wide as 80 in. are within the range of a new bed-type Mattison surface grinder installed by Burger Iron Co, Akron, O. Tolerances are held to 0.001 in., and surface roughness from 1 to 1000 mu in. can be indicated by a Brush Instrument Surfindicator.

The combination does precision tool grinding for plastics, rubber, and metalworking applications, showing cost and speed advantages over planing operations. In addition, the grinding setup wastes less stock on the work than conventional planer techniques.

Surface indications are picked up by an electronic unit fitted with a diamond tip of 0.0005-in. dia, which allows the surface indicator to trace variations on roughness across the work being ground.



Mold for corrugated asbestos siding . . .
is finished to 30 mu in. on Mattison surface grinder. Brush Surfinder on swinging arm over table checks finish on top of corrugations. Mold is 4 in. thick and 4x13 ft

Comfort, convenience and unobstructed . . .
use of drafting machines result from arranging commercial drafting tables, or desks, in a hollow square

4-Leaf clover setup boosts

Commercial equipment arranged in a hollow square allows use of drafting machines without disturbance, conservatively saves 13% in drafting time

By A L Krause, assistant director of design
Machine Tool Div, Brown & Sharpe Mfg Co

There is no surplus of good draftsmen. Therefore, it behooves all of us to provide conditions that produce more and better work from existing trained personnel and trainees. We accomplished this at Brown & Sharpe by making a study of various drafting-room layouts and modern drafting equipment, and finally evolving our own setup—a 4-leaf clover arrangement.

Before we analyze the advantages of the new setup, let's take a look at what we had before and why we used it. For many years we employed the usual in-line arrangement of drafting tables. The 8-ft tables had a 31 x 42-in. drawing board with straightedge at the left end and a reference area at the right end. The draftsman sat on the usual high stool. Attempts to encourage the use of drafting machines met with little success. The men had been trained to use a straightedge and triangle. They didn't like disturbance of a drafting machine by bumps from individuals passing behind or to the left of the drafting table.

We investigated the practical usage of various kinds of drafting boards on the market. The study covered both the types with a right-angle reference table and those with a reference table behind the drafting board. Our men preferred the right-angle table in conjunction with an easily positioned drafting board and a low swivel chair. This setup requires increased space. It is not adaptable to changes in room layout in the event of an increase in personnel during an emergency.

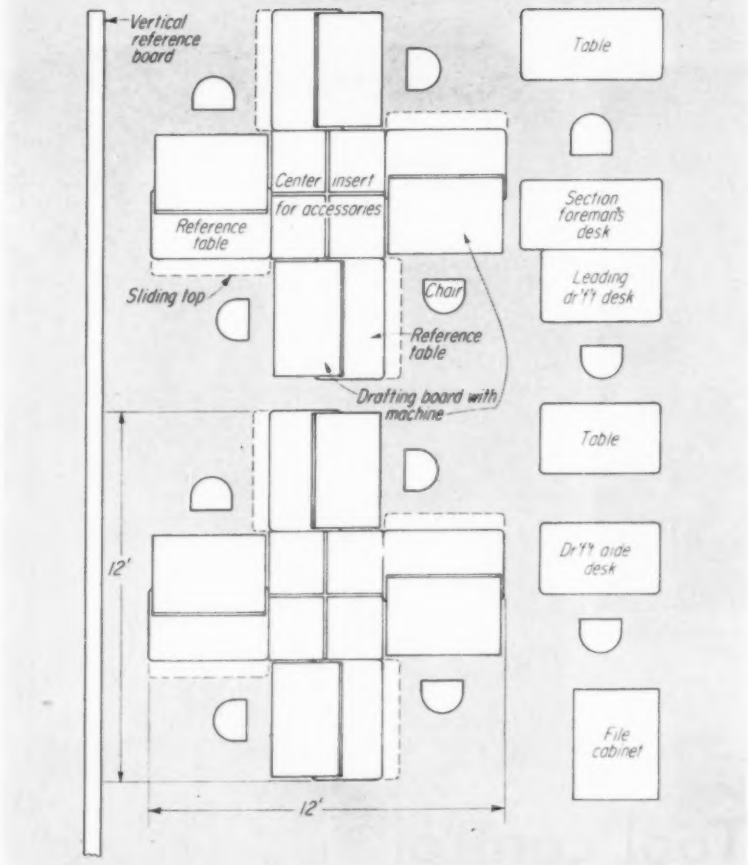
It is true that minimum space is required for the adjustable-type board, where the desk portion behind the board is used as a rear reference table by the next draftsman in the row. In this case, however, two objections arise. The first is the need to make a 180° turn to the rear reference table; second, the possibility of disturbing the drafting machine.

Finally we arrived at the 4-leaf clover arrangement, using a 26 x 48-in. board. Four commercial units are arranged in a hollow square. The units consist of the drawing board with drafting machine and a rear reference table. What are the physical advantages of this arrangement?

1. Each draftsman need swing only 90° left to his reference table.

2. All projections of the drafting machine extend to the left over the center table and not into traffic.

3. The scales can be used at all positions on the board, and there is no hazard to the draftsman using the rear reference table. Convenient use of the drafting machine with safety is obtained by mounting it



Drawing of section of B & S Drafting Room . . .
One 4-leaf clover arrangement of drafting tables goes into an area of 12 by 12 ft. Much of the draftsman's work can be done while he is seated. If he wants to use reference material or make calculations he swings 90° to the left to his reference table. By mounting the drafting machine pivot 14 in. above the top of the board and providing a stop at 45°, the man working at the reference table will not be struck by his neighbor's machine, nor can he bump it accidentally

drafting output

with its pivot 14 in. above the board and limiting angular movement of the drawing board, by means of a stop, to 45° from the vertical.

4. Storage space for ink wells, brushes, etc, is provided in the center of the four-leaf clover area.

5. In case of emergency, the equipment can be placed in rows (the usual manner) to provide room for extra personnel.

Foam-Cushioned Ease

With this new setup we have moved the draftsman down from his high stool to a foam-cushioned swivel chair. He is happier, more comfortable, but can we justify the expense? In the purchase of a machine tool, maintenance costs and increased production are readily determined. In drafting work, the differences in each drawing and the "thinking time" involved complicate estimates of savings.

To reach conclusions about savings, we made a two-part study.

We first had our industrial engineers make a method and motion study for the four basic motions involved in drawing:

(a) linear, vertical or horizontal straight lines
(b) angular lines of definite length other than 90° or 180°
(c) locational, center point for using compass
(d) locating series of points for curves

The indicated savings were 28%, 29%, 19% and 9%, respectively, for the new arrangement, as against the table-mounted drawing board with an in-line reference table area and a straight edge.

The time investigated did not include reading, study of layouts, delays or fatigue factors. The motion pattern for moving to and from the old style reference table varied considerably, depending on the type of work being done. Included in the above saving is the time for the body movements, and it was felt that a typical pattern would show a 32% saving for this portion of the time.

The second phase of the savings analysis was strictly a matter of timing the making of drawings. Here again, to eliminate thinking time, duplicates of existing drawings were made. Two apprentice draftsmen, one (*A*) who was familiar with the new equipment and the other, (*B*) who had very little experience with it.

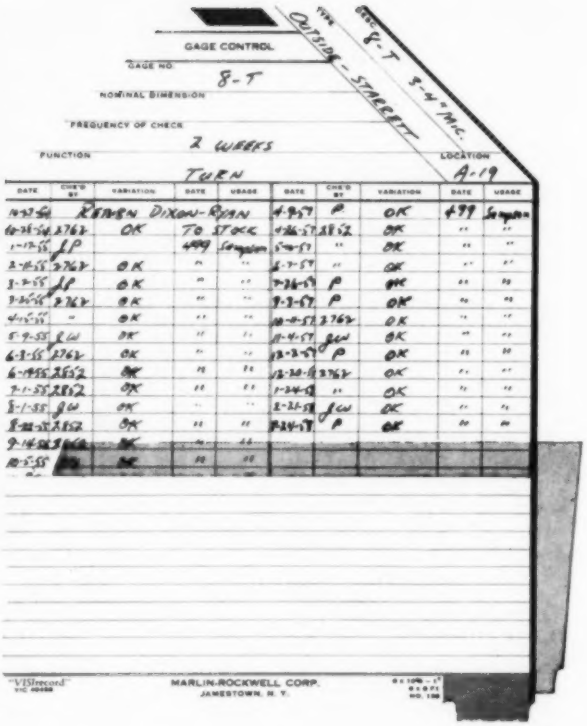
Draftsman *A* first produced a drawing on the new equipment in 7.14 hr and then produced the same drawing on the old equipment in 8.5 hr, indicating a saving of 13% even though familiarity favored the old equipment. He then repeated the drawing on the new equipment in 6 hr (29% faster than old equipment) with familiarity favoring the new equipment.

Draftsman *B* (after 5 hr experience with new equipment) produced a different drawing on the old equipment in 8 hr, took his two-week summer vacation, and then produced the drawing on the new equipment in 7.25 hr, or a saving of 10%. We feel this should be considered as the minimum because of the low experience factor and the time interval between drawings.

Pay-Out Time

If we take, as an average for the above, a conservative 13% saving, and if we allow the draftsman an additional 100% time for analysis and calculations, we can readily see where this $500 set of equipment can pay for itself in two years. Possibly more important is the savings in time of a type of worker of whom there has been no surplus and the creation of a more contented employee.

Attendant pulls gage card and can tell at a glance where gage is and when it is due for next periodic check



Gage card carries full history of periodic gage checks and the date and usage each time it is issued from tool crib

Tool control system saves time and tools

Inefficiencies in the old system were costing money, so this company picked a new one that saves time and reduces tool and gage losses to a minimum

With 70,000 gages and 65,000 tools to keep track of, the Marlin-Rockwell Corp of Jamestown, NY, manufacturer of roller and ball bearings, decided several years ago that its homegrown filing system could not handle the job adequately. Time lost in locating tools for specific jobs or for periodic checks made the system a costly one.

With the new system, equipment is located quickly, quality control is improved, and prompt repairs reduce production delays. The tool cribs can also accumulate data leading toward improvements in the design and utilization of equipment.

The system, developed by Visirecord, Inc, employs file drawers with a built-in V structure containing echeloned banks of loose, vertical 6 x 8-in. cards. Within each bank the cards are offset horizontally so that the right-hand margins are visible and can be scanned rapidly.

Every tool crib and gage room has two such files. One holds a card for each type of tool or gage kept there, and the other contains a card for each employee who borrows tools from that location.

On the tool card is an inventory and history record. Loss and breakage of tools, and the person responsible, are entered here. On the gage cards, successive inspections are recorded along with any variations discovered.

The System in Operation

When a man needs a certain tool, he fills out in triplicate a requisition known as a tool loan order. The tool crib attendant puts one copy in the tool card pocket and another in the pocket of the employee's card to post the fact that the tool has been checked out. The employee takes the third (pink) copy to his foreman to keep while the tool is in use.

When the job is done, the foreman checks the tool for any damage, marks the pink copy accordingly, and sends the tool back. The tool crib attendant then pulls the first and second copies of the tool loan order from the tool and employee file cards and posts on the tool card the use to which it was put. Loss or breakage notations are put on both the tool and employee cards. Periodically, the attendant scans the entire file for overdue tools.

Gages are handled in the same manner except that each card also carries a color index indicating how frequently the gage has to be checked. Red, for example, means a gage is checked each time it's used, blue means every two weeks, and yellow once a month. With this signal as his guide, the attendant can forward to his supervisor the serial number, type, and location of gages due for re-checks.

When an employee leaves, the record of every tool and gage he has checked out is found in one spot, the pocket of his card. No one is finally cleared unless all tool and gage equipment charged to him has been accounted for.

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True-Position Tolerancing—XVIII

By Walter H Harrington, engineering standards coordinator, Avco Research & Advanced Development Div. Wilmington, Mass.

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Bibliography

Military Government Specification (MIL-STD-8A).

Abstract from *S.A.E. Journal* by P G Belitsos, General Electric Co., which appeared in *Product Engineering* in mid-October, 1955.

Abstract from *S.A.E. Journal* which appeared in *Design News*, March 15, 1957.

"Advanced Principles in Dimensioning of Engineering Drawings," by P. G. Belitsos, General Electric Co. Presented to: The American Society of Engineering Education, Iowa State College, June 23, 1956; also, University of Wisconsin, 1956.

American Machinist Reference Book Sheets: January, February, March, 1957.

Society of Automotive Engineers. "S.A.E. Geometric Tolerances," by H. Blye, American Machine & Foundry Co., Brooklyn, NY, (*Machine Design*, Sept., 1955.)

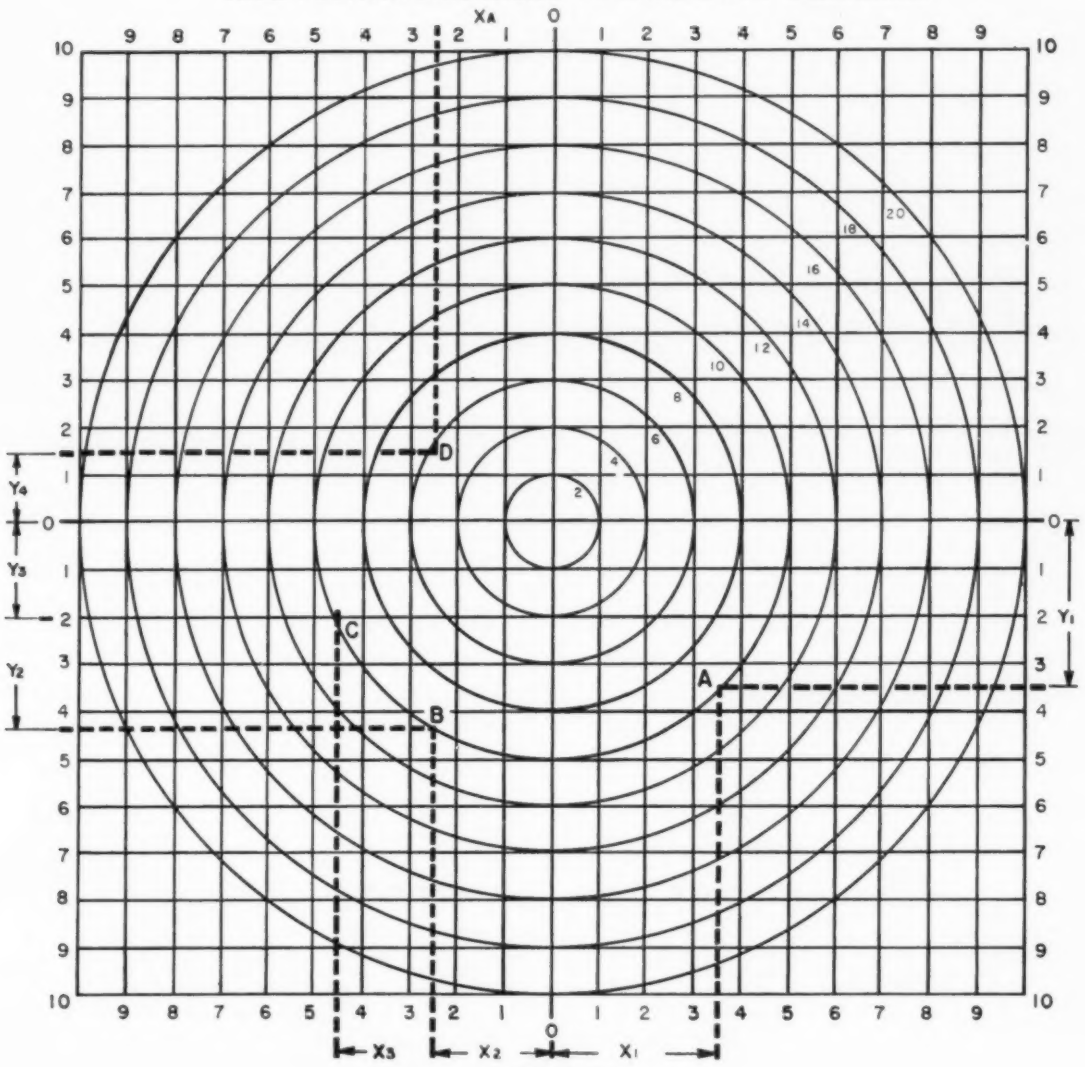
"Geometric and Positional Tolerances," by Fred L. Spaulding, Engineering Dept., University of Illinois.

ASA Standard Y14.5, published by the American Society of Mechanical Engineers, 29 West 39th St., New York.

American Machinist Reference Book Sheets: June, July, August, 1958, by Walter H. Harrington, Engineering Standards Dept., Avco Research & Advanced Development Division.

COMPARISON CHART

TRUE POSITION DIMENSIONS TO COORDINATE DIMENSIONS



EXAMPLES

POSITION OF HOLE A — X_1 = .0035 & Y_1 = .0035 OF TRUE POSITION
B — X_2 = .0025 & Y_2 = .0043 OF TRUE POSITION
C — X_3 = .0046 & Y_3 = .002 OF TRUE POSITION
D — X_4 = .0025 & Y_4 = .0015 OF TRUE POSITION

Erickson Precision Expanding Mandrels Solve Machining Problems

One of a Series

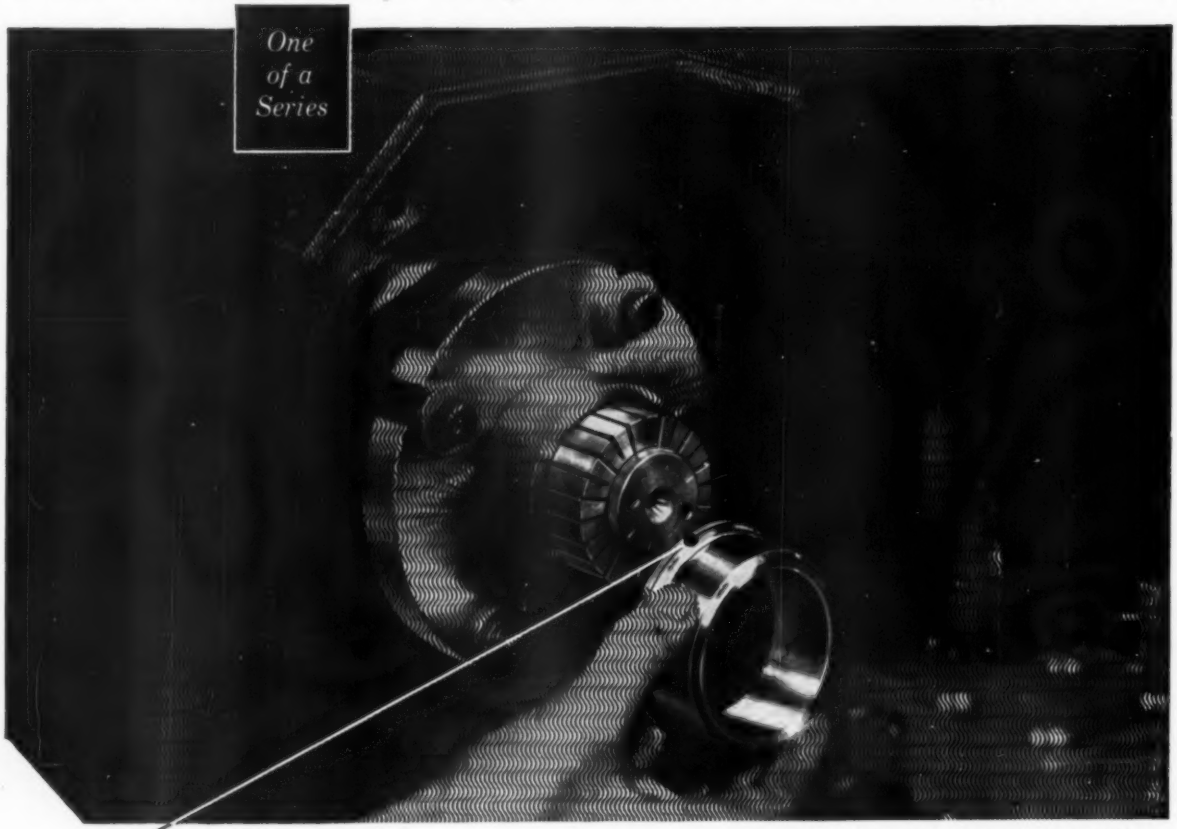


Photo: Courtesy Ex-Cell-O Corporation, Detroit, Mich.

e. g. stainless steel aircraft sleeves

Tolerances of the highest order are required on aircraft sleeves. And when the material is stainless steel this can lead to production problems.

But Ex-Cell-O Corporation short-circuits their problems by using an Erickson 4½" C Drawbar Expanding Mandrel on an Ex-Cell-O precision boring machine. By using the Erickson mandrel they are able to machine completely the outside diameters, face a shoulder and put chamfers on both the OD and the ID of the exposed end. Production is up, rejects and scrap are down.

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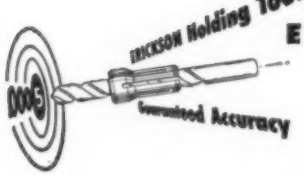
AA-6723

Collet Chucks
Floating Holders
Tap Chucks
Indexers



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Common Thread-Fit Problems

This helpful guide to the specific causes of thread misfits, iheir symptoms and means of detection was compiled jointly by the three SPS Screw Thread Metrology Laboratories at Jenkintown, Cleveland, and Santa Ana, Calif, where problems on screw thread fits are solved for industry

By John B Twining, chief metrologist, Screw Thread Metrology Laboratory, Standard Pressed Steel Co, Jenkintown, Pa

Possible Cause	Detection	Accuracy Direct Reading to:
	Bolts Loosen in Tapped Hole	
(a) External thread PD is too low	(a), (c) Measure pitch dia on 3-roll gage	0.0001
(b) Internal hole is oversize	(a), (c) Check major dia with micrometer or supermike	0.0001
(c) Tapered threads	(b), (c) Check tapped hole with thread plug gage or internal thread comparator	0.0001
(d) Incorrect preload	(b) Check minor dia with plain plug or adj. internal micrometer	Plus functional gage fit
	(d) Check proper installation	
	Binding in a Tapped Hole	
(a) PD or major diameter oversize	(a), (c), (d) Measure PD on 3-roll gage set up (PD & functional)	0.0001
(b) Excessive lead error	(a), (d) Check major dia with micrometer or supermike	0.0001
(c) Improper thread form	(b) Check lead on lead tester	0.00001
(d) Tapered thread	(c), (d) Thread form and lead by optical comparator	To 100X mag.
	(c) Use form and radii charts	To 100X mag.
	Thread Will Not Start	
(a) Distorted lead thread	(a) Check on optical comparator	To 100X mag.
(b) Nicked lead thread	(a) Check with ring thread—also visual	Functional check
(c) Mating parts not same class or size of thread	(b) Visual check and use of ring thread	Functional check
	(b) Use of microscope	40X
	(c) Use of magnetic plating thickness gage, 3-roll gage or internal thread comparator	0.0001
	Loose or Sloppy Fit	
(a) Undersize PD	(a), (d) Use PD & functional 3-roll gage	0.0001
(b) Mating parts not same class or size of thread	(b), (d) Internal thread comparator	0.0001
(c) PD of tapped hole is oversize	(b) Ring thread and thread plug gages	Functional check
(d) Tapered thread	(c) Thread plugs—internal thread comparators	Functional check
	(c) Three-wire check with mold of tapped hole	0.0001
	Low Torque When Used With Locknut	
(a) Locking feature of nut won't meet torque requirements (on standard studs)	(a) Use of torque wrench and standard stud	inch oz.
(b) PD of bolt is undersize	(a) Use of thread plug gage	Functional check
	(b) Use of PD and functional 3-roll gage	0.0001
	(b) Three-wire check	0.00001
	Excessive Torque When Used With Locknut	
(a) Locking feature of nut won't meet torque requirements (on standard studs)	(a) Use of torque wrench and standard stud	inch oz.
(b) PD of bolt is oversize	(a) Use of thread plug gage	Functional check
(c) Lack of lubricant on locknut	(b) Use of PD and functional 3-roll gage	0.0001
	(b) Three-wire check	0.00001
	(c) Visual inspection	Visual
	Galling Threads	
(a) Burrs	(a) Microscope check	40X
	(a) Use of ring thread	Functional check
(b) Excessive lead errors	(b) Use of lead tester	0.00001
	(b) Optical comparator	100X
(c) Materials prone to galling—not properly plated	(c), (e) Chemical test (etching)	(To magnify laps)
	(c) Magnetic plating thickness gage	0.0001
(d) Poor surface finish on threads	(d) Use of surface roughness checker	1 micro inch
(e) Lapped threads	(d), (e) Use of microscope	40X

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Dimensional change with temperature

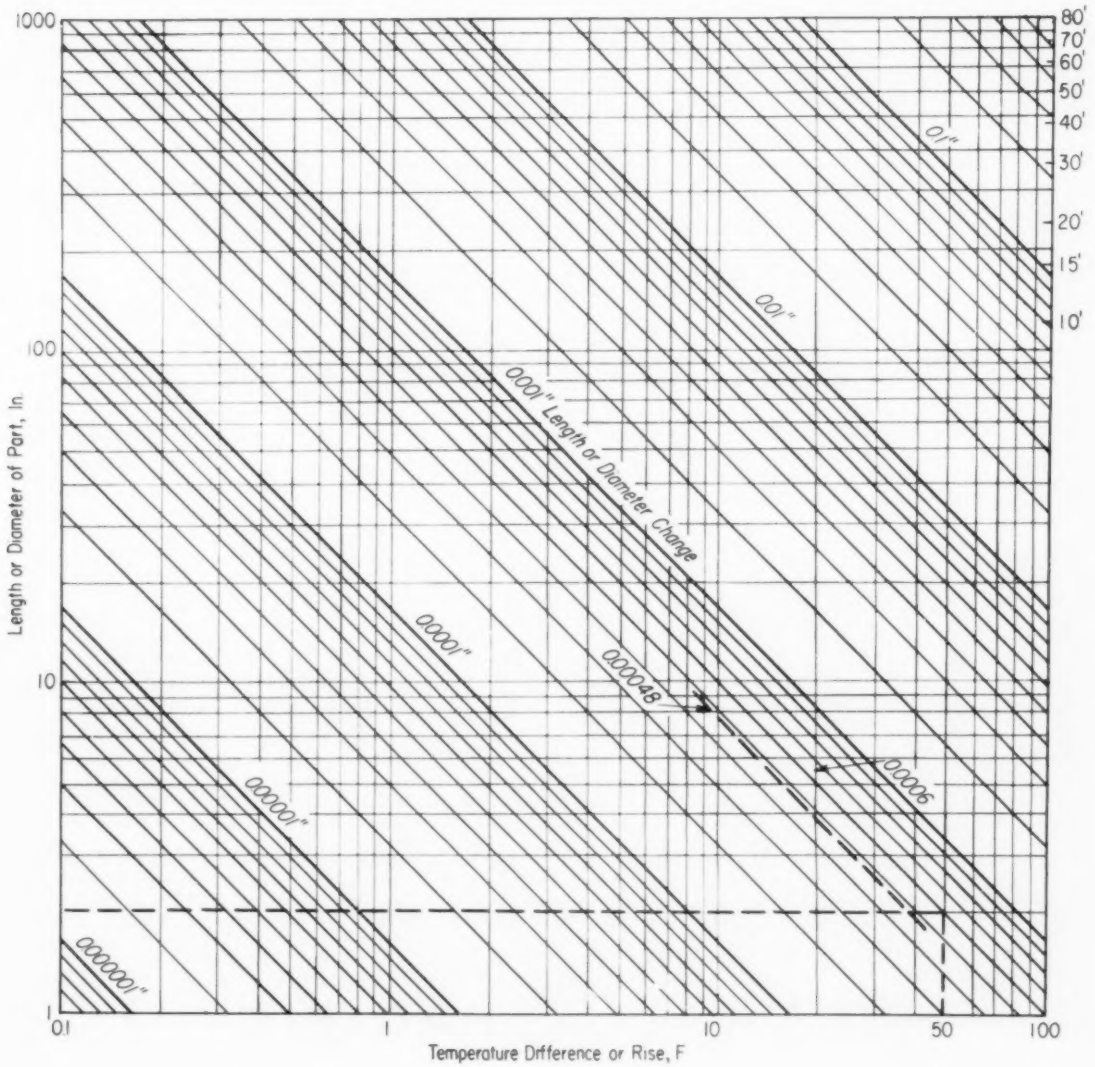
By Charles Tiplitz, chief engineer, Chalon Consulting Engineers, Cedar Grove, N J

This chart is based on expansion or contraction of soft steel, which has an approximate coefficient of expansion of 0.000006 in. per inch of length or diameter, per degree Fahrenheit temperature change.

Example: A 2-in. steel shaft will run in a bronze bearing. Temperature rises will be: 50F for the shaft, 40F for the bearing. How much will the two members expand under running conditions?

Solution: From 2-in. dia at left of chart move right to 50F temperature rise. The intersection with the diagonal line occurs at 0.0006 in. expansion for the steel shaft. For a 40F temperature rise (for bearing) the intersected diagonal is 0.00048 in., but because the bearing is bronze we apply a multiplier of 1.67, giving 0.0008 in. as the actual expansion of the bearing.

Multipliers are: for aluminum—2.13; for bronze—1.67, as stated, and magnesium—2.38.



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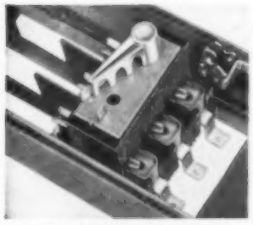
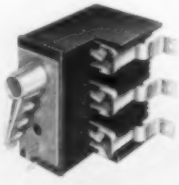


VISIBLE BLADES FOR MAXIMUM SAFETY—Lets you see at a glance whether switch is "ON" or "OFF"—makes inspection easy. Silver-alloy contacts insure positive connections—reduce wattage loss.



INTEGRAL HANDLE MECHANISM FOR GREATER CONVENIENCE—handle mechanism and switch are combined in a single unit—eliminates excess linkage—prevents misalignment and false indication of switch position.

DEIONIZING ARC QUENCHERS FOR COOLER, FASTER INTERRUPTION—eliminate pitting and provide higher interrupting ability. Arc is divided, cooled, and extinguished in the quencher, rather than on the contact surfaces.

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Talking Shop...

"Indirect" Problem

A FINGER WAS POINTED at a major problem of automation recently by Chester Johns of Buhr Machine Tool. The resulting shift of workers from direct labor to indirect labor usually calls for higher skills. But the present high wages for direct labor have discouraged the sacrifices required to acquire the needed skills. No way has yet been found to pay trainees enough to make the time involved in learning attractive.

Futurarmy Construction

OFF-THE-ROAD construction equipment used by the Army in the future will have to be airborne. Such equipment has to be heavy to be effective in operation, but light to be transported by air. A solution to this dilemma has been found by the Engineers Corp by designing equipment of light materials with a large ballast tank. After landing, the equipment scoops up dirt and fills its own ballast tank with enough pounds of dirt to make a machine of the weight required for heavy bulldozing, grading, and other construction work. According to previews of this equipment given by the Engineers Corp at the recent SAE construction meeting, the equipment will be ballastable up to double the weight when carried by air. Before settling on dirt as ballast, water was tried and abandoned (harder to find, to load, and it freezes). These changes in design are going to create some interesting production problems for the plants used to building heavy construction machinery.

Broach Inserts

THROW-AWAY INSERTS can make spectacular savings in broaching. In one case at an automotive plant, the savings amounted to $9,500 per insert change. The job involves the removal of 1/16 to 3/32 in. from the mounting surfaces of cast iron oil pump brackets. Fourteen rectangular carbide inserts were originally used along with three finishing blades on a two-station vertical machine. Because of corner wear, the broaches had to be reconditioned after every third shift at an average cost of $250. The new broach with Kendex Grade K6 inserts uses round buttons to remove most of the stock and square inserts to clean up the remainder. The new broach ran 116 shifts before the inserts had to be indexed the first time.

Timely Warning

PRESSURIZED CANS are becoming increasingly common not only in the home but in industry for a variety of sprays, cleaners, and paints. Such cans always carry a warning about the hazards of excessive heat. Remember this hazard may continue to the disposal stage and a can still under pressure dumped in an incinerator can cause a dangerous explosion. At Allison, for example, such cans are disposed of in red trash barrels—never in regular waste containers. The same precautions should be oberved with pressure cans you use at home. After the can has been exhausted, it can be placed in city trash, but it should never be put in a home or apartment incinerator.

Determination

ANXIOUS TO EARN a production contract from the Air Force, a small instrument company in the Mid-West was working hard to complete the prototype of the needed assembly. One casting was just too big to swing in the company's largest lathe, which was fairly new. So out came the cutting torch. They cut off the ways at the headstock, cut the lathe in two; then joined the two halves by bolting two small I-beams under the ways, to form a gap lathe. An extension was added to the leadscrew. They got the production contract.

MEMOS

by BESS RITTER

Although it would be difficult to convince today's machinists that there are genuine gremlins in the prosaic metal nickel, this is exactly what the early German prospectors believed, when they first discovered nickel, for this simple reason:

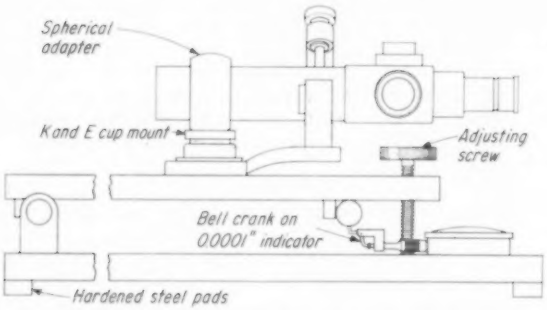
> **Since it looked so much like copper when it was in ore form, miners believed that it actually was copper. When it didn't react like copper when it was smelted, it was reasoned that a gremlin or "Nicholas" which was trapped inside the ore was being deliberately mischievous.**

It's easy to imagine the bitterness of the remarks that were made by these miners about the "kupfernickels" (i.e. copper nicholases) because they prevented the ore from yielding a goodly supply of "kupfer." The gremlin variety was contemptuously tossed aside and considered to be something that was absolutely worthless.

> **This seems to be unbelievable, from today's point of view, because nickel is such an important metal now; however it wasn't until the late date of 1751 when a Switzerland scientist named Cronstedt did some research on the subject that it was first discovered that "kupfernickel" wasn't a kind of pseudo copper, but an entirely different metal in its own right. He had little choice other than calling it "nickel," since this name was already quite firmly established.**

Practical Ideas...

Jig-Alignment Telescope Checks Surface Plates



Your Reference Book Sheet article on "How to Check Surface Plates" (AM-Oct 21, '57 p 183 to 187) intrigued me. However, not having access to an autocollimator, the necessary instrument described in the article, I had no way to try the process.

But because we had a definite need for a means of checking our surface plates, I designed, after some planning, a sine-plate mount for our K & E jig-alignment telescope. This setup enables us to measure variations in seconds from a line of sight.

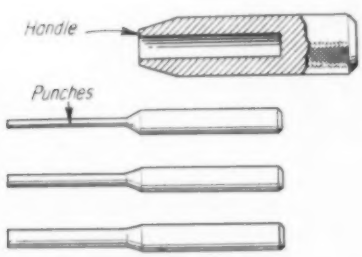
While the autocollimator process described in your article will measure angular variations of 0.1 sec. with a corresponding deviation from flatness of 0.0000025 in., I am able to measure deviations from flatness of 0.000025 in. which we feel is accurate enough for our needs.

Mounted on the sine plate by means of a cup mount and spherical adapter, the jig-alignment telescope, when focused at infinity, functions as a collimator. The mirror-carriage base is 5 in., the same size as that used in the collimator setup.

Center distance of the pins on the sine plate is 20.408 in., making a 0.0001-in. change in height equal to 1 sec. of arc. An indicator calibrated in increments of 0.0001 in. is mounted on the base of the sine plate. A precision bell crank is affixed to the indicator to transfer vertical motion to horizontal as the bell crank contacts the sine pin and indicator simultaneously.

Parallelism of the sine plates is controlled by an adjustment screw through the top plate. Material used in the construction of the sine plate is ¾-in. A-1 tooling plate.

Minton B Ryder, inspection supervisor, American Machine & Foundry Co, Brooklyn NY



Low-Cost Drift Punches

Any time a tool or part of a tool can be made to serve double purpose you gain the advantages of savings in cost and space. The illustrated handle, which is used on all the punches shown, is such a tool. The fact that only one handle is needed for all punches is the space-saving feature. That all parts are shop made is the economy end of it.

Because we use drift punches of both long and short varieties for inserting and removing press-fitted dowel pins, we found that the replacement cost, which used to be quite an expense, is now cut to a minimum. The parts are easily machined and, providing good steel is used, should give satisfactory service.

In making the handle it should be pointed out that the reamed hole ends in a flat bottom. Hardening must be controlled so the handle won't chip or mushroom where struck. The shanks of the punches all slide-fit into the handle and are turned or ground to the desired punch diameter.

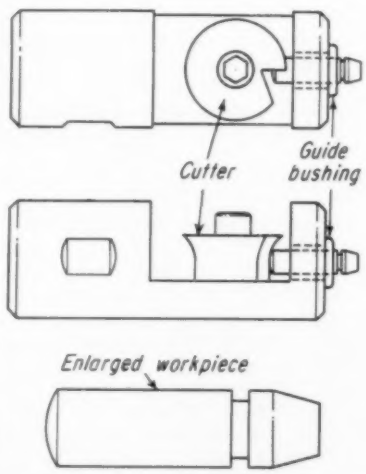
Walter Gerstel, Berkeley, Calif.

Deburring Attachment Powers Radius Tool

A second operation was necessary to complete small parts produced in a B & S automatic. The first operation, which produced a radial groove, a taper, and a bore, was performed without a hitch. But the second called for a radius at the opposite end without center or edge burrs.

This operation was successfully carried out with the simple radius tool shown. It fits into the B & S revolving deburring attachment which has become standard equipment on our machines.

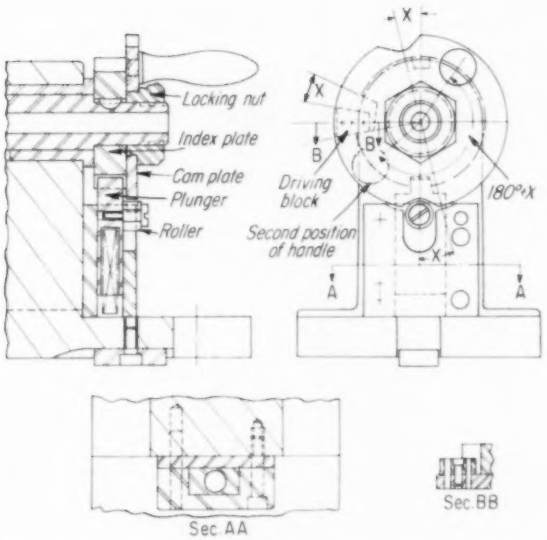
As the work is cut off it is picked up by a B & S pickup arm equipped with a collet. The collet grips the workpiece tightly and feeds it through a guide bushing in the radius tool. The revolving tool then rounds the part to a perfect radius.



The tool is made from a piece of ⅝-in. round drill rod, milled with a ¾-in. wide slot to receive a specially made cutter. High-speed steel is used for this cutter, which is turned to a 5/16-in. radius on its periphery with a ⅝-in. major diameter. A deep V-cut produces the cutting edge, and a 3/16-in. hole gets a 10-32 socket-head capscrew for mounting the cutter. The front end of the tool is fitted with a hardened guide bushing.

Henry J Bissonette, Plainville, Conn

One Hand Operates Indexing Mechanism



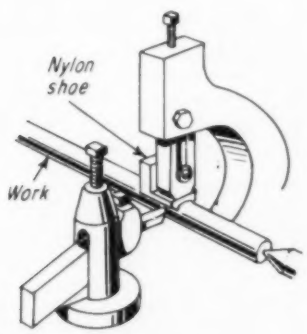
Most indexing fixtures are made with indexing pins or plungers operated with one hand while the rotating member is turned with the other. The sketch at left shows a mechanism for two-position indexing in which a plunger is withdrawn and the fixture spindle is rotated in one motion of the operating handle.

This is accomplished by a cam plate that works against a roller attached to the plunger. Notches in the cam allow the spring-loaded plunger to drop into either of two accurately spaced slots. Indexing from one position to the other is done by a *forward-and-reverse* motion, not by any one directional rotation. Hence the reason for the cam notches not being located diametrically opposite each other.

The index plate, which has two slots 180° apart, is keyed to the fixture spindle and is held in place by a locking nut. A third slot in this plate is located at 90°, plus dimension X, from the index slots. Dimension X is the motion necessary for the cam to release the plunger before the index plate can be rotated.

The cam plate, which is free to rotate on a shoulder of the locking nut, carries a driving block to engage the index plate. See Sec. BB. The radial sides of the drive notch are identical to the sides of the block with the added width of dimension X. A standard machine handle mounts conveniently on the face of the cam plate.

F Murray, Chicago, Ill



Steadyrest Jaws Get Nylon Shoes

Conventional steadyrest and follower-rest jaws, when used as is, sometimes mar the finish of a workpiece. It is for that reason lathe operators will use a subterfuge like a canvas strip between the jaws and the work with some success. But, even when liberally lubricated, this material wears too fast.

To provide the jaws of our rests with better and longer lasting bearing surfaces, we have fitted them with nylon shoes. The resiliency of nylon makes it a yielding yet tough bearing surface. It can be lubricated with either oil or water which means that the water-soluble oil compound used on many lathes is an ideal lubricant.

The shoes are cut from block nylon into L-shaped pieces. One leg of the L is drilled to permit the shoe to be bolted to the jaw. The other leg is provided with a short shallow radius, finishing off in a bevel on each side.

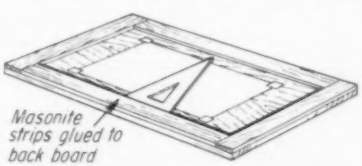
H Koslow, Bronx N Y

Shop Drawing Board Needs No T-Square

A lot of our workplans and layouts are made out in the shop, at the bench or machine. It is then a convenience to have a small drawing board and, for any degree of accuracy, a matching T-square handy.

The board shown is designed for around-the-shop use and offers a big improvement over the old T-square routine. It employs only a triangle for the vertical and horizontal lines otherwise made by a T-square. Other angles, such as 30°, 60° or 45°, are just as easily drawn.

Tempered Masonite board ⅛ in. thick is used for the frame. After laying out our opening we drill a hole in each corner, saw out the rectangle, and finish the edge by milling for complete accuracy. However, strips of Masonite can serve just as satisfactorily if carefully assembled. The sketch below shows the method used. In either case, the



opening should be 1 in. wider and 1 in. longer than the dimensions of the largest paper used, to allow for masking tape at the corners.

The back board is also tempered Masonite either ⅛ or ¼ in. thick. The rough surface of the frame is glued to the smooth face of the back board and allowed to dry. When the glue has set, the outer edges of the board are trimmed and smoothed. The board, complete with triangle, a supply of paper and pencils, will make a neat package in a large manila envelope, always ready when needed.

Howard Levy, Brooklyn, NY

Practical Ideas...

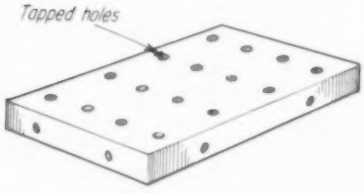
V-Jaw Adapts C-Clamp To Specialized Work

A short piece of angle iron, welded to the jaw of a C-clamp, will permit round work to be held securely.

The photo shows a typical application for the altered clamp. It is employed to hold a piece of pipe to a flat bar while the two are being welded together. This is the sort of a job that is usually difficult to grip with a plain C-clamp.

When welding the angle to the clamp, the only thing to look out for is that the apex of the V is fairly closely aligned with the axis of the clamp screw.

H J Gerger, Stillwater, Okla



Tooling Plate Saves Time

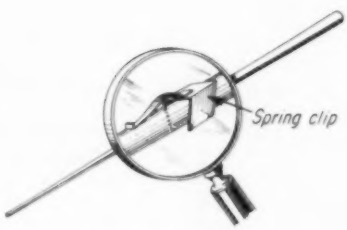
Milling, grinding, drilling, and layout work are some of the many machining operations made easier by the use of the simple tooling plate shown. The work is attached to the plate which is in turn either gripped in a milling or grinding vice, mounted on a precision angle plate, or secured directly to the machine table or grinder chuck.

With the accurate faces and edges of the tooling plate as reference, the job of shifting a workpiece for subsequent machining is simplified. The size of the plate makes it an ideal surface plate for small-work layout.

The material in the plate is ⅝ in. thick CRS, 10 in. long and 5 in. wide. A number of holes are drilled and tapped through the plate for clamping workpieces. Holes are also drilled and tapped along the edges for the purpose of fastening fences or stops. All holes must be liberally countersunk to prevent raising burrs.

After the plate has been pack hardened it is ground all over. Flatness, parallelism, and squareness must be held to close limits or the purpose of the plate is defeated.

S S Milardo, Middletown, Conn



Tapered Pin Measures Small Holes

A useful small-hole gage can be made from a rod ground to an accurate taper. A spring clip, similar to a pocket-pencil clip, will be necessary to indicate the extension of depth that the rod enters a hole. This clip must be able to slide up on the large diameter of the rod as well as hold its position on the smaller end.

In use, the clip is placed near the small end of the rod which is then entered perpendicularly into the hole to be checked. When the rod seats in the hole, the clip is checked for contact with the work face and the rod is withdrawn. A micrometer is then used to measure the diameter of the rod where the end of the clip is located.

The gage shown was made from a 5-in. piece of ⅛-in. hardened drill rod. Four of the five inches were centerless ground to a uniform taper making the small end 0.025 in. The clip was made of 0.015-in.-thick carbon steel with a V-shaped hole to grip the rod and provide the friction. The clip was hardened after a good fit was assured.

Raymond Pajer, tool room supervisor, Greist Mfg Co, New Haven, Conn

WILLIAM DeGROAT
Altadena, Calif

won **$25** **In addition to regular payment for his idea:**

BANDSAW WELDER SUBS FOR SPOT WELDER

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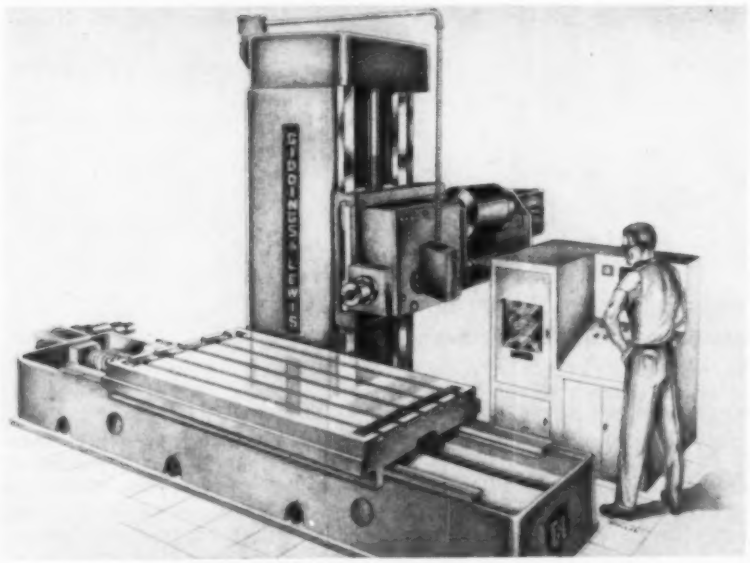
JUDGES—A group of 200 *American Machinist* readers is asked to select preferred articles in each issue. The group is a true cross-section of all readers, and changes entirely each time. Their votes, in addition to guiding the editors, select the best Practical Idea. If at any time their votes result in a tie, $25 will be paid to each co-winner. Decision of the readers will be final in each case.

REQUIREMENTS—Only items in the Practical Ideas pages are eligible, and they must be submitted directly by the originator. Do not worry about your shortcomings as a draftsman, photographer, or author—every item will be edited in accordance with *American Machinist* standards and suitable illustrative or explanatory material added where needed. Readers will judge only the finished product—in terms of its usefulness to them.

WHO MAY ENTER — Anyone may enter except employees of the McGraw-Hill Publishing Co, Inc, and those of advertising agencies or departments. Suggest to your employees that they submit ideas.

HOW TO ENTER — Send all entries to "Practical Ideas Editor," American Machinist, 330 West 42nd St, New York 36, N. Y.

New Shop Equipment
Materials and Parts



G&L Numerically Controlled Die Sinker Cuts Lead Time and Costs by 50% or More

Under tape control, a DiMil numerically controlled milling machine can generate any defined surface. It can be programmed for a wide range of profile milling, including dies, molds, cams, templets, and many prototype and production parts. Both table- and floor-type models are available. Most work can be handled on one of the six table models, the smallest of which has a 36 x 48-in. working surface. These machines have a moving table and a fixed column. Large work, up to the biggest dies now in use, can be handled on the floor models. On these, the column carries the head and moves on a runway; the workpiece is fixed.

Both types of machines are available with 10- or 20-hp heads. These quill-type milling heads have 38 spindle speeds, from 10 to 1780 rpm. An 18-in. head traverse and 10-in. quill extension are standard. A decimal readout system indicates exact cutter position.

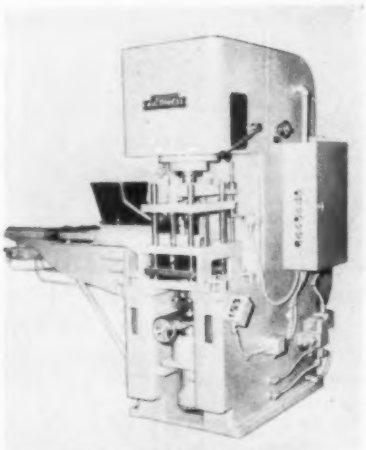
Machines are controlled by a G&L Numericord continuous-path magnetic tape control system. Manual operation (pushbutton changeover) also is provided for general-purpose machining. To insure that tools are replaced when necessary, particularly during long cuts, tool change is programmed along with all the other machine functions.

The first working dies machined under numerical control were produced by a prototype of the DiMil in about half the time required by conventional methods. A large hammer die was produced with a 43% reduction in manufacturing time over that required by the templet method. This time included complete programming and recording of the tape. Actual machining time was reduced 67%. Bench-and-polish time was cut 62% because of the accuracy and finish achieved. When a duplicate of the first die was machined, total manufacturing time was reduced 77%.

Actual die milling time, under tape control, may run only ¼ to 1/3 that required with templets and highly skilled operators. Noncutting intervals and single positioning operations are eliminated.

Giddings & Lewis Machine Tool Co, Fond du Lac, Wis

MORE DATA? Circle 51, inside back cover



Hydraulic Compacting Presses Eliminate Scrap Loss

Line of hydraulic compacting presses, capacities ranging from two through 75 tons, provides automatic, precise control of each step in compacting or pelletizing operations. These Multipresses eliminate scrap loss by making the ram pressure and speed controls adjustable up and down. Timing prevents fracture of parts (due to vacuum) at time of ejection.

Uniform fill and density, even for ring-shaped parts, is assured by the incorporation of several exclusive features—ram pressure reversal, retractable core pin, and rotary agitator or vibratory grid feeder.

Presses range from five through 75 tons in floor models and from two through 10 tons in bench models. Single lever control permits either single stroke or automatic cycle operation.

When preset ram pressure is reached the main ram reverses and the knockout ram advances to eject the piece from the die. On the next cycle the shuttle feed box advances automatically and pushes finished pieces from the tooling.

Strokes are adjustable from 1/32 to ½ in. on presses through 10 tons and from ¼ to ½ in. on presses from 15 to 75 tons.

Denison Engineering Div, American Brake Shoe Co, 1160 Dublin Rd, Columbus 16, Ohio

MORE DATA? Circle 52, inside back cover

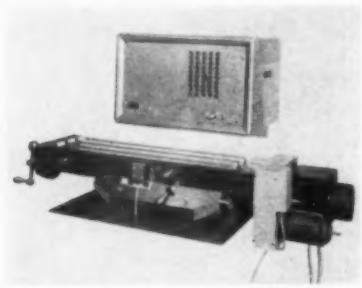
Heavy-Duty Cleaning Machine Handles Loads of 3500 lb

This 20-cu-ft-capacity Rotoblast barrel, Type 20 GN, is designed for increased cleaning speed, greater flexibility and reduced abrasive loss. The 30-hp motor throws 50,000 lb of abrasive per hr.

A heavy-duty work conveyor handles loads up to 3500 lb, with single pieces up to 800 lb each. Abrasive-tight doors and housing retain the abrasive within the machine and permit economical use of the new types of abrasives. The doors are power operated. A quick-acting work loader, with double cables for safety, delivers each batch into the machine. The pushbutton control panel is located alongside the cleaning chamber opening. Unit is 8 ft 5 in. deep by 11 ft 10 in. wide and 16 ft 11⅝ in. high.

Pangborn Corp, Hagerstown, Md

MORE DATA? Circle 53, inside back cover



Positioning System Adapts to Both New and Old Machines

This numerically controlled positioning system, known as the Weditrol Positioning System, can be adapted to most machines, new and old, and in many cases by the users themselves. All positional distances in translation are measured and set in inches and decimals, and are on an absolute basis.

Specifications include a range of 99.999 in. in steps of 0.001 in.; an accuracy and repeatability within 0.00025 in.; automatic take-up of backlash. System is available in pushbutton keyboard types for manual setup and fully automatic versions controlled by standard 1-in. punched paper tape.

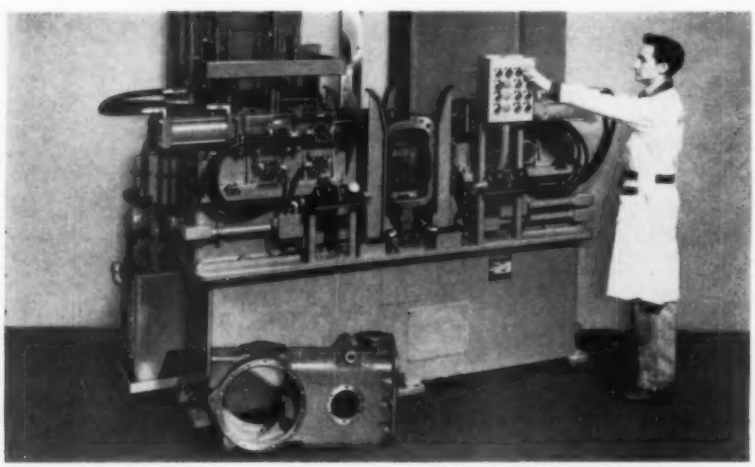
Also available is a new series of punched tape block readers for standard 1-in., five- to eight-hole paper or Mylar tapes. Readers are designed to read a fixed block of information of 12, 16 or up to 20 lines (up to 160 bits) on the tape at one time.

Wang Laboratories, Inc, 37 Hurley St, Cambridge 41, Mass

MORE DATA? Circle 54, inside back cover

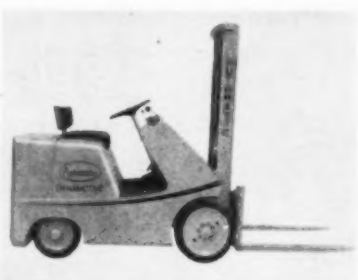
3-D CAMS produce an ouput motion determined by two input variables. Cams provide important savings in space and weight—*American Cam Co, Inc, PO Box 2106, Hartford, Conn*

MORE DATA? Circle 55, inside back cover



ASSEMBLY MACHINE inserts and burnishes bushings in one operation by means of a double-acting tool slide arrangement. Tractor center housings are manually loaded. The housings are then accurately clamped in position, and the split bushings are manually loaded on opposed burnishing tools. A button is pushed and the automatic cycle begins. Production is 62 housings per hr at 80% efficiency—*Expert Automation Machine Co, Division of Expert Die & Tool Co, Inc, 17144 Mt Elliott Ave, Detroit 12, Mich*

MORE DATA? Circle 57, inside back cover



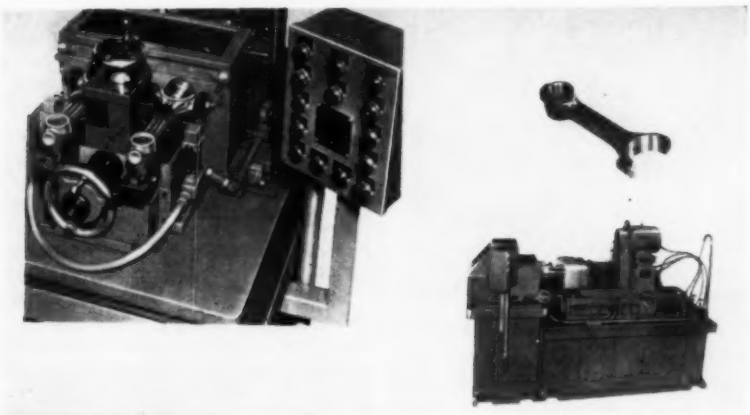
Fork Lift Trucks Available in Capacities of 4000 to 10,000 lb

Dynamotive fork lift trucks, gas-operated—electric driven, are available in capacities of 4000 to 10,000 lb with lifting heights to suit all applications. Travel speed of 8.5 mph and a lifting speed of 75 fpm (with 4000-lb load) permit faster operation.

The gas engine transmits its power through a variable voltage generator to a matched dc series-wound electric drive motor. Fuel savings of up to 30% are claimed.

Automatic Transportation Co, Div of Yale & Towne Mfg Co, 149 W 87 St, Chicago 20, Ill

MORE DATA? Circle 56, inside back cover



Standard Gun Drilling Machine Processes Wide Range of Parts, Materials, Holes

Hole concentricity, squareness, finish, and size are reported to be held to critical tolerances on this precision drilling unit; secondary reaming operations are eliminated. Except for load and unload, entire operation is completely automatic; these additional functions can be provided as extra equipment.

Cutting tool is driven by a torque drive adapter, with a contact switch, which protects cutting tool from breakage. If gun drill is dull or improperly ground, creating excessive torque, torque drive will rotate to contact switch which takes tool out of feed, and causes it to rapid return to the back position. Cutting oil is delivered to the rear end of the rotating spindle during running of machine; it serves as both coolant and chip flusher.

Unit will handle two parts simultaneously and is capable of drilling holes from 0.187 to 0.750 in. in dia. Spindle speed ranges from 2000 to 8000 rpm. Feed rate varies from 0.0001 to 0.010 ipr, and feed stroke can be adjusted from 1 to 12 in. Max stroke, for tool change, is 20 in. Longer strokes and larger drill sizes are available in other models.

Crescent Tool & Machine Co, 25125 W Outer Drive, Melvindale, Mich

MORE DATA? Circle 58, inside back cover

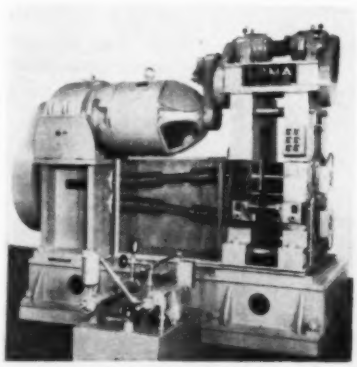
Rotary-Head Automatic Bender Is Machine Loaded

This 100% automatic bending machine, reported to be the first rotary-head automatic, is machine loaded. Thus, the law of diminishing returns does not operate to reduce the ratio of grooves per die to pieces per min. Known as the Pedrimatic, the machine has no tangent limitations. It can produce U-bends whose tangents are 6 ft long if desired.

Chief feature is the loading arrangement. Machine is end loaded by either an air or hydraulic cylinder. Entrance of the new piece ejects the already bent piece.

Pedrick Tool and Machine Co, 3640 N Lawrence St, Philadelphia 40, Penna

MORE DATA, Circle 59, inside back cover



Heavy-Duty Combination Rolling Mill Compacts Metal Powders

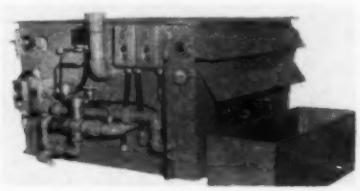
This heavy-duty 2-high/4-high combination rolling mill converts from a conventional vertical strip mill to a horizontal mill for compacting metal powders into sheet and strip.

Changeover from the 8½ x 8-in. 2-high setup to the 2½ and 8½ x 8-in. 4-high setup takes only 30 minutes. The 2-high arrangement is used for either hot or cold breakdown rolling of plate and sheet, and grooved rolls are also available for processing rounds, squares and other shapes. In the 4-high arrangement strip is cold rolled to gages as thin as 0.002 in.

When compacting metal powders, the 8½-in.-dia 2-high rolls are provided with a powder entry guide and an exit chute. Material up to ⅛ in. thick can be made from powdered metal.

Loma Machine Mfg Co, Inc, 114 E 32 St, New York 16, NY

MORE DATA? Circle 60, inside back cover



Lundholm Offers Combination Filter and Dragout Conveyor

Features of new unit, called Liquid Filter, include a continuous or intermittent clean coolant automatic back-wash. Filtering medium consists of tubular screen rotating at the same speed as conveyor system.

Back-wash is operated in conjunction with dual electric controls. Micro sizes of filtration are determined by screen size and timing adjustment of back-wash. One pump and motor furnish clean coolant to machine or tool, at the same time furnishing clean coolant for back-washing. Unit will handle water, water soluble, and oil coolants. Sizes range from 10 gpm and up.

Lundholm Manufacturing Co, 1121 Charles St, Rockford, Ill

MORE DATA? Circle 61, inside back cover

Automatic Rotary Conveyor Indexes Polishing Heads

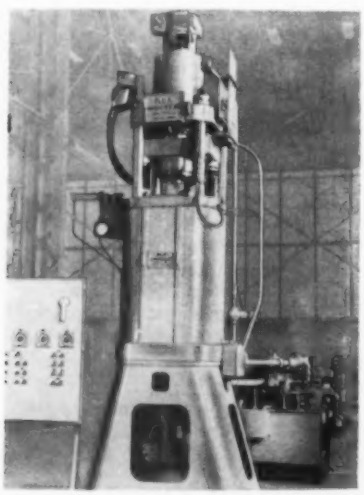
Model RJ indexing conveyor is designed for use with polishing, buffing, and brushing head units on au-

tomatic installations. Rotary dial conveyor consists of a heavy welded steel base into which is mounted the complete dial and work spindle driving mechanism. Speed adjustments for indexing drive and work spindle rotation drive are made by opening the front louver door.

Workholding dial is provided with six ball-bearing-mounted fixture spindles of 1½-in. dia by 3 in. Dial index rate is adjustable from 120 to 1800 indexes per hr with fixture spindle speed adjustable from 12 to 100 rpm. Other speeds are also available. Fixture spindles are equally spaced on a 45-in.-dia circle. Dial diameter is 51 in.; fixture spindle tops are 42 in. from the floor.

Divine Brothers Co, Seward Ave, Utica, NY

MORE DATA? Circle 62, inside back cover



Powder Compacting Press Handles Two Materials Simultaneously

Automatic, hydraulic press can compress two entirely different materials in the same operation. Two independent, shuttle-design feed shoes and hoppers make possible bi-material compacting, such as combined iron-ceramic brake linings, or bimetal electrical contacts, at production speeds up to 15 per minute.

Models are available in 50, 100, 200, 300, and 500-ton sizes. They are designed to produce complex parts rapidly, accurately, and with all needed adjustments for die fill pressure, ejection, and timing sequence controlled electrically and hydraulically from a control panel.

Kux Machine Co, 6725 N Ridge, Chicago 16, Ill

MORE DATA? Circle 63, inside back cover

Heavy-Duty Lift Truck Available In 15,000 and 20,000-lb Models

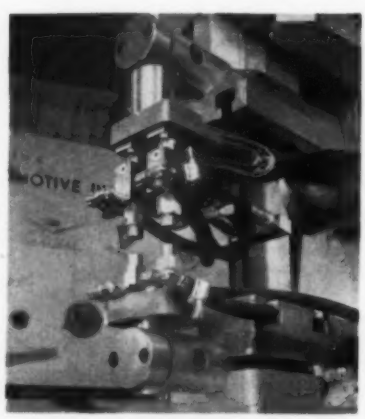
Available in capacities of 15,000 and 20,000 lb, these G-5 lift trucks feature rugged construction, compact design for good maneuverability, and rapid operation. The 15,000-lb model has a 112-in. turning radius; the heavier model, 113 in.

Rapid acceleration and instantaneous power response are provided through a fully automatic torque converter transmission with two speed ranges. Transmission has a 2.17 to 1 torque multiplication. Lifting speed is 50 fpm, loaded; 60 fpm, unloaded. Standard hydraulic tilt on truck is 10° back and 6° forward for safely nesting loads in transit and ease of load placement.

Truck is powered by a V-8 motor using either gasoline or LP-gas. Coil handling rams and a variety of other hydraulic attachments may be used in place of the forks.

Yale & Towne Mfg Co, Yale Materials Handling Div, 11,000 Roosevelt Blvd, Philadelphia 15, Penna

MORE DATA? Circle 64, inside back cover



Resistance Welding Die Adapter Permits Simultaneous Welds

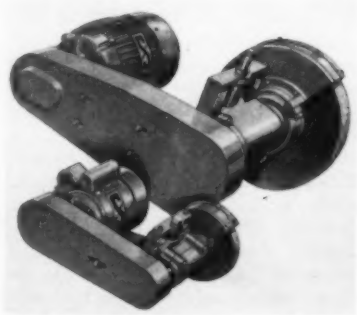
New design of the Nu-Twist die adapter makes it possible to make two or more welds simultaneously on the same machine with welding pressures and current equalized on each weld.

Closed hydraulic system, formed by interconnnecting the die adapters, automatically maintains uniform forces on each welding tip. Action is instantaneous, and automatically compensates for minor variations in tolerances which would tend to produce excessive force on high points and insufficient force at low points.

Electrode inserts for projection welding, spot welding, and electrical upsetting can be switched in seconds by loosening the adapter, interchanging inserts, and tightening in place. Complete line of adapter bases and inserts is available.

P R Mallory & Co, Indianapolis 6, Ind

MORE DATA? Circle 65, inside back cover



GRINDING SPINDLES are available in sizes ranging from a ½-hp unit with a 6-in. grinding wheel to the 20-hp model with a 24-in. wheel. Wheel spindle can be adjusted vertically—*Standard Electrical Tool Co, 2488 River Rd, Cincinnati 4, Ohio*

MORE DATA? Circle 66, inside back cover

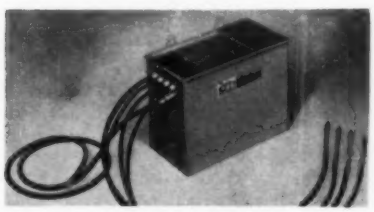
Countersink Tool Features Micrometer Depth Stop

This fully adjustable micrometer-stop countersink is a lightweight hand tool which may also be used for production work on drillpresses,

lathes, millers, or wherever chucking is available. Rapid adjustment for depth of cut is made by retracting the thimble and rotating to any desired position. Machine-cut serrations provide positive locking of the thimble when it is released. Final cut is accurate within ±0.001-in. limits. Tool is available in sizes from ⅜ to 1½ in., in five standard angles.

Schrillo Aero Tool Engineering Co, 8715 Melrose Ave, Los Angeles 46, Calif

MORE DATA? Circle 67, inside back cover



MIST COOLANT GENERATOR is available in 1-gal size with one or two mist outlets and a 4-gal size with 1, 2, 3, or 4 outlets. Portable unit operates on any airline, requires no special coolants—*Kett Tool Co, 5055 Madison Rd, Cincinnati 27, Ohio*

MORE DATA? Circle 68, inside back cover

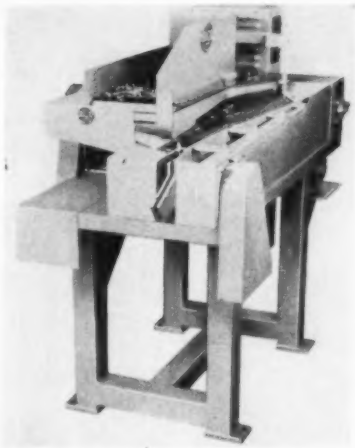
Clarifier Removes Sludge From Cutting Oils and Coolants

Gravity clarification unit provides continuous, direct flow, controlled fluid velocity for the removal of metallic chips and abrasive particles from cutting and grinding oils and water-base coolants. Retention time for proper settling is 7 to 9 minutes. No filters are used; removal is by gravity alone.

Flow capacities range from 20 to 1000 gpm, with tank capacities from 140 to 7600 gallons.

Delpark Div, Indiana Commercial Filters Corp, Dept C-287, Lebanon, Ind

MORE DATA? Circle 69, inside back cover



Parts Feeder Handles Fragile Or Highly Finished Parts

Model 330-NM Non-Mar feeder automatically orients and feeds such parts as finished wrist pins, hydraulic valves and plungers, bearings, glass or ceramic insulators, etc, at speeds of up to 30,000 pieces per hr. Parts handled can be flat, round disks or rings, cylindrical or rectangular in shape. Demand-feed control assures smooth continuous flow of parts to equipment being fed, whether single or multiple.

Radio Corp of America, Industrial Automation Equipment, 12605 Arnold Ave, Detroit 30, Mich

MORE DATA? Circle 70, inside back cover

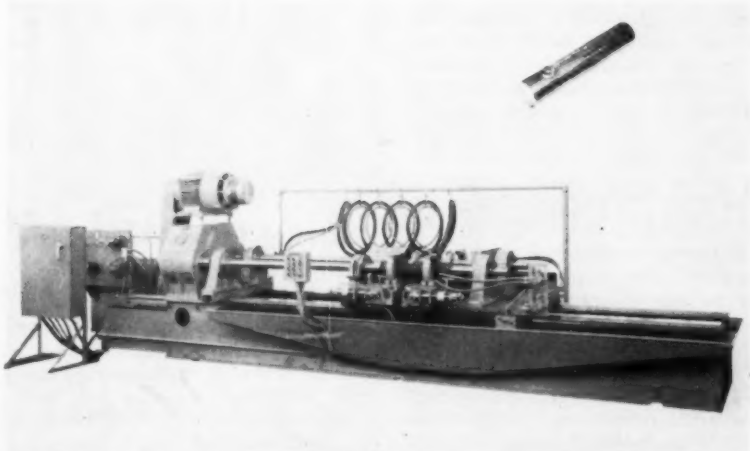
Universal Toolholder Does Work Of Six Fixed-Position Units

Universal - positioning Uni - Max, available in three sizes, 5, 6, or 8 in., holds any 3/16 to ½-in. toolbit or boring bar, round or square, in any horizontal work position.

Design provides positioning for carbide tip as well as HSS cutters, eliminating need for special holders for each type. Rotating clamping cap has annular serrations that heel with radial serrations on the shank for a perfect grip with no lateral movement possible. Straight serrations on the toolbit slot and rugged half-inch capscrew with grip head and hex socket give added holding strength.

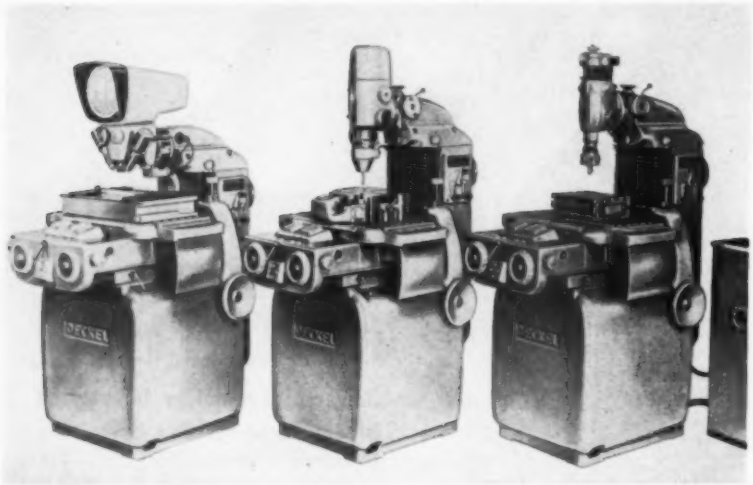
Maxwell Industries, Inc, 493 E Fifth Ave, Ashtabula, Ohio

MORE DATA? Circle 71, inside back cover



TUBE BORING MACHINE is a two-station unit with a capacity of 4¼ through 9 in. dia, 18 through 48 in. length. Change gears provide adjustable spindle speeds of 68 through 510 rpm. Table feed is adjustable from 0 through 10 ipm, with a rapid advance speed of 250 fpm. Clamping is automatic. At end of automatic cycle, spindles are positioned to permit withdrawal of tools from workpiece—*Davis and Thompson Co, 4460 N 124 St, Milwaukee 18, Wis*

MORE DATA? Circle 72, inside back cover



Machines Have Interchangeable Jig Boring, Jig Grinding, Optical Projector Heads

The Deckel (German) LK series of machine tools feature interchangeable jig boring, jig grinding and optical projection measuring heads on one base. Changing heads takes only minutes. Machines can be used as three single-purpose units; or one base may be used with three heads.

Direct numerical readings of settings eliminate reading errors. Table measurements can be read directly to 0.0001 in. The stationary transverse scale is mounted on the machine base, and the movable longitudinal scale on the worktable slide. The projection screens, one for each scale, are mounted on the cross-slide. Under test, operators have achieved a reading accuracy of ±0.00002 in. Actual positioning accuracy falls within 0.00012 in. The range of coordinate readings for the jig boring and grinding machines is 15.75 x 10 in. Worktable area for the machines is 25.6 x 11.8 in.

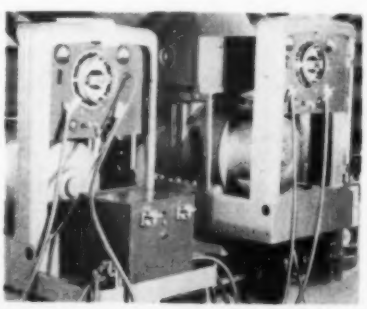
Machines are designed for thermal stability. The supporting bracket has built-in compensation for thermal expansion. A special air duct dissipates heat generated by the drive motor; extra large amount of oil maintains practically constant gearbox temperature. Specifications vary with choice of heads:

- *Jig boring*—20 spindle speeds from 40 to 3150 rpm; six feed rates, up or down. Max work height is 24 in.
- *Jig grinding*—12 planetary-motion speeds from 40 to 500 rpm; stepless grinding speeds from 15,000 to 60,000 rpm. Max work height is 18¾ in.
- *Optical projection*—Magnification of 10 or 20X on a 7⅞-in.-dia. screen. Useful measuring table area is 18.7 x 10.6 in.

A wide variety of accessories adds to the further versatility of this series of machine tools.

Imported by Cosa Corp, 405 Lexington Ave, New York 17, NY

MORE DATA? Circle 73, inside back cover



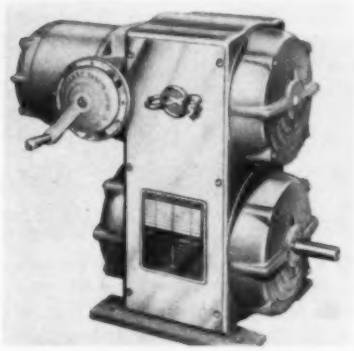
Attachment Permits Arc Welders To be Used in Parallel

Completely enclosed in a 13 x 16 x 15-in. steel case, this attachment simplifies the paralleling of two arc welders when it is desired to use their combined capacity for such work as automatic welding, arc cutting, stud welding, etc. It also provides protection to the welders in the event of either machine being set or adjusted improperly, or failing to perform properly.

Unit weighs about 145 lb and consists of a magnetic contactor controlled by a pushbutton and by a protective current relay. Should the two welders become badly unbalanced, current will flow in the equalizer circuit, tripping the protective relay, which trips the contactor. Attachment can be used with any Hobart electric, gasoline or diesel-powered rotating-type dc welder rated for 60% duty cycle or higher.

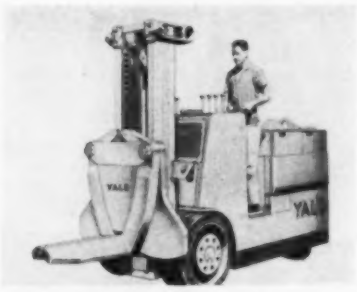
Hobart Brothers Co, Troy, Ohio

MORE DATA? Circle 74, inside back cover



ADJUSTABLE SPEED DRIVE, designated Allispede Drive offers infinitely adjustable speed range up to 8:1 with output speeds of 1 to 10,000 rpm. The drive, which operates from an ac power source, is available in ratings from 1 to 20 hp—*Louis Allis Co, Dept P, 427 E Stewart St, Milwaukee 1, Wis*

MORE DATA? Circle 75, inside back cover



Electric Lift Trucks Handle Loads up to 20,000 lb

Designated the Yale K410 line, these new trucks measure only 108½ in. from the rear of the counterweight to the face of the fork carriage and 50½ in. in width across the drive wheels. Turning radius is 92⅝ in.

Available in capacities of 12,000 to 20,000 lb, trucks accommodate 60- and 72-v batteries to provide power to meet severest handling conditions. A 95-in.-over-all-height channel provides a max lift of 106¾ in. The

How to do the Toughest 400 Ton Heavy Material Blanking Jobs *economically*

Use a press properly designed to exert the tremendous forces required.

Use a press with the rigidity and mass to withstand the terrific shock of impact and sudden release of "snap-through" force encountered when blanking, punching or shearing heavy material.

Use a press that will give you high production with longer die life.

Use *the* heavy duty blanker . . . MINSTER 40E-9

The construction features that put the Minster 40E-9 press in a class by itself for this type of work are described and illustrated in a new Bulletin No. 12. May we send you a copy?

THE MINSTER MACHINE COMPANY • MINSTER, OHIO

CIRCLE 281 READER SERVICE CARD

channel and lift mechanism design gives a free lift of 20 in.

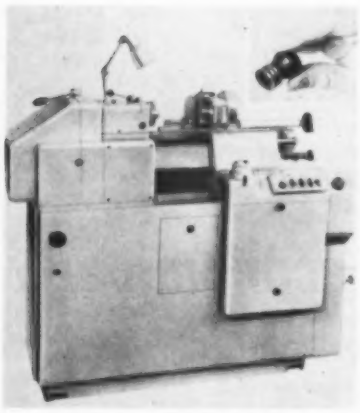
Hydraulic tilt, 10° back and 6° forward, safely nests loads in transit. Trucks can be equipped with forks, a ram single coil handling, a hydraulically operated split ram to handle two coils simultaneously, or a wide variety of specialized attachments.

Yale & Towne Mfg Co, Yale Materials Handling Div, 11,000 Roosevelt Blvd, Philadelphia 15, Penna

MORE DATA? Circle 76, inside back cover

26 ASSORTED END MILLS ranging from standard to long length and from 2 to 4 flutes and 32 different tracer tips for flat-end and round-end roughing and finishing are available in a kit—*Turchan Follower Machine Co, PO Box 6055, Dearborn 9, Mich*

MORE DATA? Circle 77, inside back cover



Semi-Automatic Machine Cuts Internal and External Threads

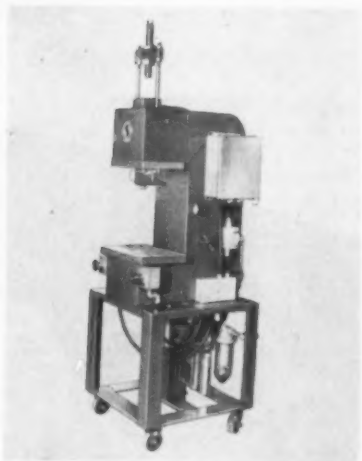
Swiss-made thread generating machine, the Jaggi MF-57, cuts both internal and external threads at a faster rate than thread chasers or grinders. It can be used economically for lots as small as 10 pieces or less, and is easily operated by unskilled labor.

Employing a principle known as "thread whirling," in which tungsten carbide tools whirl around the workpiece, the machine is reported to cut threads that are extremely accurate in pitch diameter and very smoothly finished. Single-pitch as well as multi-pitch threads can be produced. Speeds of the tool spindle and the work spindle can be adjusted to suit the job.

Maximum diameter of external threads produced is 2⅜ in. (3⅜ in. with a special toolholder); max diameter of internal threads is 3⅜ in., minimum internal thread diameter is ⅜ in.

Imported by Carl Hirschmann Co, Inc, 30 Park Ave, Manhasset, NY

MORE DATA? Circle 78, inside back cover



High-Speed Presses Have Positive Ram Speed and Stop Control

Designed for high-speed production, these air-hydraulic presses offer positive ram speed and stop control with no overtravel. Ram pressure is adjustable from two to 12 tons with identical speed cycle. No cooling water is required regardless of cycle speeds.

Presses are equipped with two-hand safety controls, wired for either momentary contact through timer control for positive stroke cycle or manual control. The ½-in. power stroke is controlled by a Micro Switch. Available in 2½, 5 and 10-ton models, press weighs 850 lb, has 12-in. daylight, and a throat depth of 6½ in. Total over-all height is 47 in. Model illustrated is the A-H-1000 10-ton unit.

Studebaker Hydraulic Products Co, 1733 N 33 Ave, Melrose Park, Ill

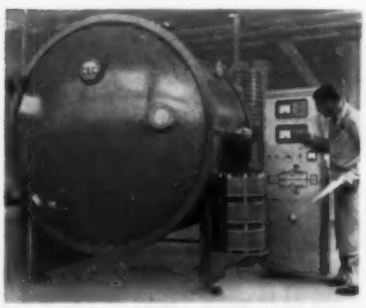
MORE DATA? Circle 79, inside back cover

50-hp Milling Spindle Converts Planer to Milling Machine

This multiple-speed, 50-hp spindle converts planers and other machines into high production milling machines. Speeds range from 225 to 1200 rpm. Powered by special class-B-insulation 70°-rise motors, these milling spindles are designed for high metal removal on a range on materials including mild steel, cast iron, stainless and other high-heat-resistant steels. The geared spindles have a No. 50 NMTB spindle nose with a quick-change feature permitting rapid cutter change.

Futurmill, Inc, 6360 Highland Rd, Pontiac, Mich

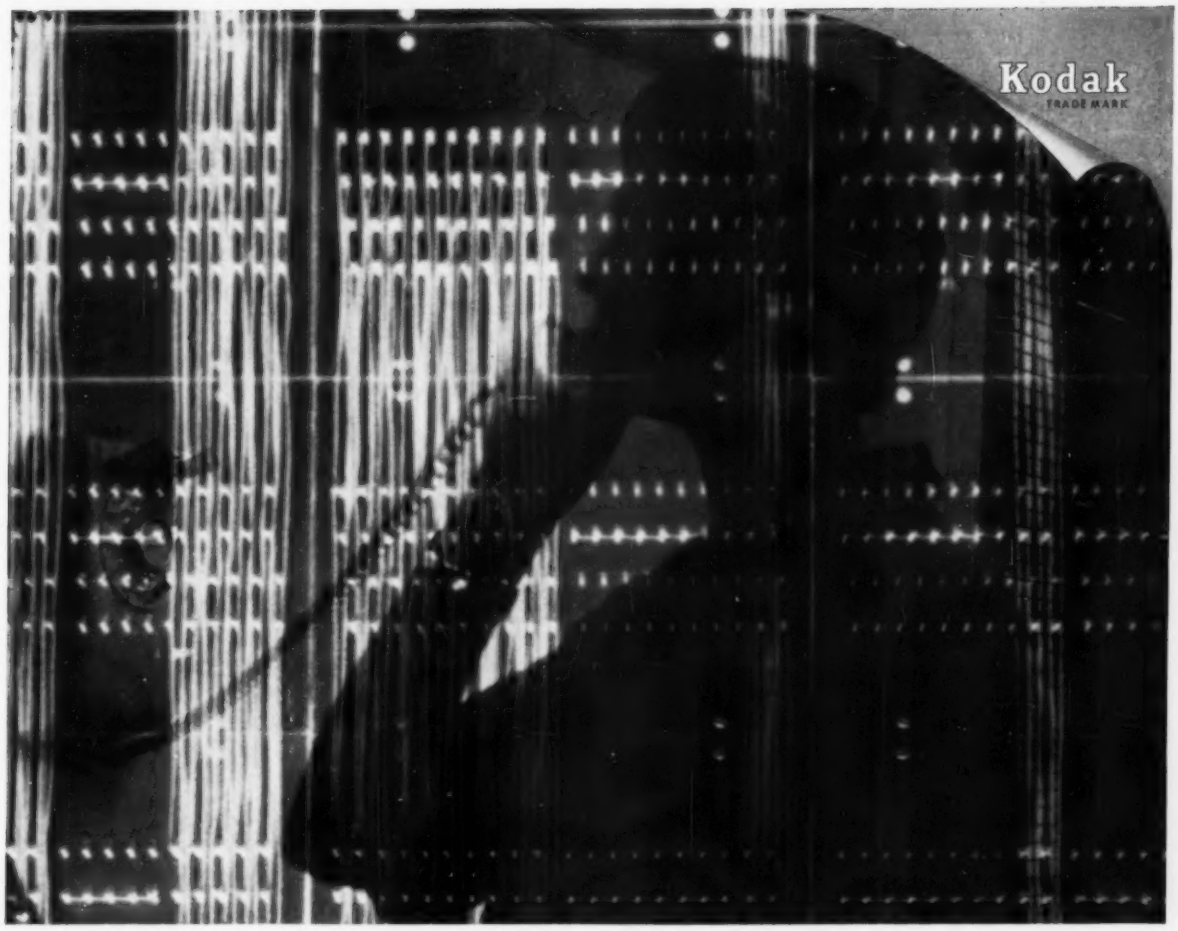
MORE DATA? Circle 80, inside back cover



Production Vacuum Coater Has Semi-Automatic Vacuum Cycle

Designed to vacuum-metallize workpieces up to 22 x 50 in., this 72-in. vacuum coater, Model LC1-72, has a planetary drive fixture with six rotating stations. Each of the six stations has six removable workholding rods that may be adjusted along the length of each spoke of the station fixture to working diameters of from 2 to 20 in.

The complete vacuum cycle is semi-automatically controlled by a four-position indexing switch on the control panel. A complete cycle, from insertion of the parts into the cham-



Here's a case where optical gaging is the only practical answer

The heart of the central dial switching system made by Stromberg-Carlson, Division of General Dynamics Corporation, is the XY* Universal Switch.

A key "muscle" in this heart is a small wiper spring, whose 24 exact dimensions resisted measurement by mechanical means. Yet any flaw in this critical component could seriously impair telephone service.

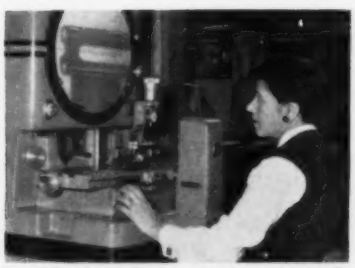
With the Kodak Contour Projector all 24 dimensions of this wiper spring are optically gaged to tolerances of ±.0005"—and the job takes just *three minutes.*

In this case Stromberg-Carlson found that optical gaging was the *only* practical inspection method. Special mechanical gages could have been devised, but then inspection would have taken—not three minutes—but as much as an hour per part.

Because Stromberg-Carlson makes and uses a wide variety of complex, hard-to-inspect products, the company uses 9 Kodak Contour Projectors in its Telecommunication Division, alone. They solve problems in receiving, production, and tool inspection as well as in final inspection.

If you have a gaging problem that involves close-tolerance measurement of precision parts with many dimensions, you can probably solve it best with a Kodak Contour Projector. To find out how optical gaging can help you, send for the booklet "Kodak Contour Projectors."

Final inspection of a 24-dimensioned wiper spring, a vital part of Stromberg-Carlson's dial switching mechanism, is practical only with optical gaging.



In another inspection area, an operator easily measures the critical dimensions of a relay lever arm with a Kodak Contour Projector to assure exact tolerances.

*XY is a registered trademark of Stromberg-Carlson

Apparatus and Optical Division

EASTMAN KODAK COMPANY, Rochester 4, N. Y.

the KODAK CONTOUR PROJECTOR

ber to removal of the coated items, has been made (with polystyrene workpieces) in nine minutes. Operating range for the unit is from 5×10^{-5} mm Hg to 2×10^{-3} mm Hg.

Consolidated Electrodynamics Corp, Rochester Div, 1775 Mt Read Blvd, Rochester 3, NY

MORE DATA? Circle 81, inside back cover

Barrel Finisher Uses Interchangeable, Compartmentized Barrels

Model V8 8-cu-ft barrel finishing machine uses vinyl-lined barrels that are divided into one, two or four compartments. Rotational speed is 12 to 36 rpm. The multi-compartment barrels permit simultaneous processing of different workpieces in the same machine.

Barrels have quick-lock, gasketed doors with side opening. Machine has a total height of 49 in., a barrel clearance of 21 in. above the floor, and requires less than 22 sq ft of floor space.

Rampe Mfg Co, 14915 Woodworth Ave, Cleveland 10, Ohio

MORE DATA? Circle 82, inside back cover

Vibratory Finishing Machine Laps 35-in.-dia Parts

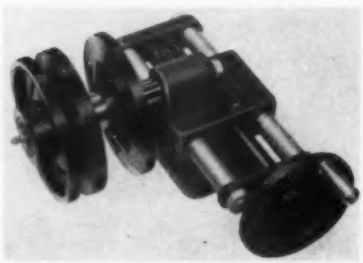
LP-4 lapping machine uses controlled electromagnetic vibration for fast processing of metal parts weighing in excess of 75 lbs.

Unit's electromagnetic drive produces 3600 amplitude and frequency regulated vibrations per minute from 60 c ac passed through a half wave selenium rectifier in its separate control box. This vibration produces a vertical movement which is coordinated with a radial movement by means of a tuned leaf-spring system. Result is a combined rotary and forward movement of the parts over an abrasive cloth in the pan.

Model can handle single parts as large as a 35-in.-dia shaft seal component or groups of smaller parts, several or many at a time, depending on size. It will also polish metallographic specimens in quantity for microscopic inspection.

Syntron Co, 311 Lexington Ave, Homer City, Penna

MORE DATA? Circle 83, inside back cover



Variable Speed Pulley Provides Wide Range of Speeds

Wide range of speeds can be obtained from small, constant speed motors by means of a double variable pitch unit (mounted on adjustable control base) which automatically adjusts driver and driven sheave belt speeds according to its distance from the motor.

The High Ratio Pulley is furnished in two models. Fractional to ½-hp unit has a ratio of 6:1 with PD varying from 1.875 to 4.60. Fractional to 1-hp unit has a 7.2:1 ratio with PD from 2.40 to 6.50.

Lovejoy Flexible Coupling Co, 4866-H West Lake St, Chicago 44, Ill

MORE DATA? Circle 84, inside back cover

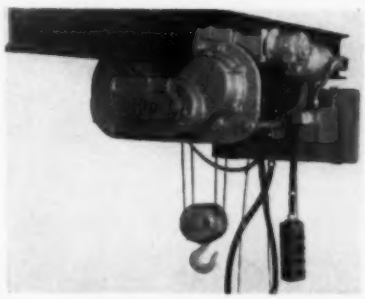
GE Extends Its Carboloy Line Of Disposable Inserts

The Carboloy line of inserts has been more than doubled by the latest additions. Carboloy grades 78 and 78B are now available through the complete line for general-purpose work, with grades 330 and 999 for precision finishing.

Of the ten new sizes, nine are precision-ground no-radius so that customer, for economy, can add his own radius. Inserts with special or non-standard radius are offered in increments of 0.001 in. up to 0.125 in. One new size, the 7/16-in. (inscribed circle) triangular insert, is offered in various grades.

General Electric Co, Metallurgical Products Dept, 11177 East Eight Mile Rd, Detroit 32, Mich

MORE DATA? Circle 85, inside back cover



Newly Designed Trolley Offered For Lo-Hed Wire Rope Hoists

Four-wheel motor driven trolley hoist has new design features that result in lower price, and with headroom, end approach, and side clearance dimensions lower than previously possible.

Trolley will run on special monorail track or standard I-beam and is being offered on all Class A, B, H, and J Lo-Hed single-speed, two-speed or variable-speed heavy-duty hoists which have lifting capacities ranging from one to 15 tons, operating on all voltages and frequencies of ac or dc with pushbutton control.

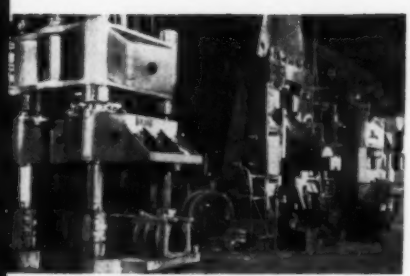
American Engineering Co, Wheatsheaf Lane & Sepviva St, Philadelphia 37, Penna

MORE DATA? Circle 86, inside back cover

AIR BLOW GUN releases any amount of flow required by slight pressure on the trigger. Ten-inch extension nozzle is available in both straight and curved design—*Perfecting Service Co, 332 Atando Ave Charlotte, NC*

MORE DATA? Circle 87, inside back cover

Meet the proud crew that operates



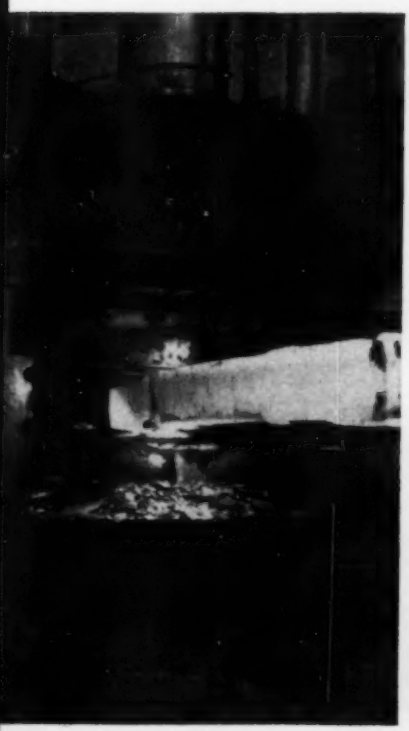
The line-up, left to right: a 1500-ton hydraulic trimming press; a 50,000-pound steam drop hammer; a 3,000-ton pre-form press; a 750-ton blocking press.

THE LARGEST PRIVATELY-OWNED FORGING HAMMER IN AMERICA!

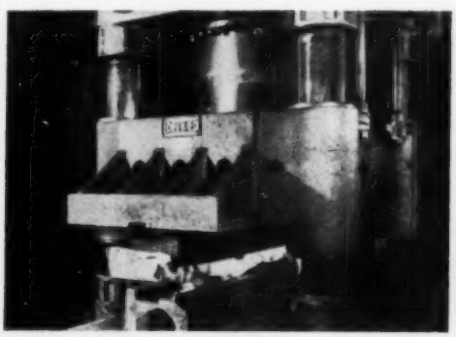
They work at Park Drop Forge Company in Cleveland, and they handle this giant 50,000-lb. Erie steam drop hammer with such precision they claim they could crack a watch crystal without damaging its works!

To meet the rugged requirements of turning out 13-foot-long diesel crankshaft sections, Park Drop Forge looked to Erie Foundry for a complete installation of forging machines including hammer and presses.

If your requirements include forging machinery or rugged hydraulic presses, why not consult Erie Foundry Company?



The blocking press in action . . . first step in forging bar stock.



The snaking press makes a preform of the bar to prepare it for the hammer.

In the Erie trimming press, the flash stays on top of die while forged shaft drops through.

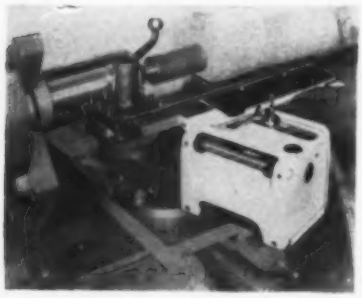
Now the mighty giant 50,000-lb. Erie hammer starts the work of forging the 13-foot crankshaft section.

ERIE

Greatest name in forging machinery since 1895

ERIE FOUNDRY CO.

ERIE, PA.



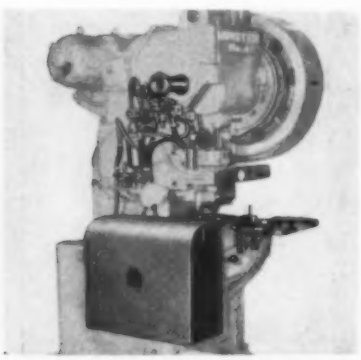
Attachment Replaces Regular Lathe Compound for Precise Duplicating

Profil-Matic hydraulic duplicating attachment is installed in place of the regular compound and functions through a stylus sensing the convolutions of a master templet. Device can be installed either parallel to the lathe bed or in line with the cross-slide, allowing the machine to turn, bore and face to its maximum capacity.

Rough and finish cuts, or inside boring and outside turning are possible in one chucking because any 4-way or universal toolholder can be used. Because of the light stylus pressure, hardened templets are not needed.

G/K Products, 9548 Gidley St, Rosemead 1, Calif

MORE DATA? Circle 88, inside back cover



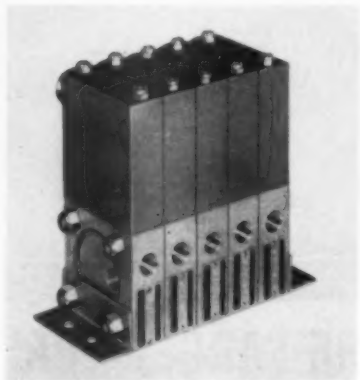
Mechanism Boosts Press Output, Prevents Operator Injuries

Device for OBI presses is a mechanical hand with pneumatic fingers (or vacuum cups) that picks up the product parts in rhythmic succession from an adjacent table, locates each precisely in the die nest, actuates the press, and ejects the finished part.

Production increases of 100% to 500% for secondary operation work are reported. Operator's hands are never brought into the die area. Mechanism is available for back-geared presses operating at 30 to 60 spm, and also for flywheel presses running up to 165 spm.

Press Engineering Co, 2722 W Chicago Ave, Chicago 51, Ill

MORE DATA? Circle 89, inside back cover



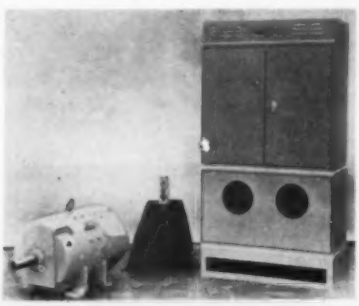
Solenoid Control Valve Is Only One Inch Thick

This solenoid-operated valve, designated Quick-As-Wink S-3C-S, is only 1 in. thick, 3 in. wide and 6 1/16 in. high. Designed for oil or air use at pressures to 125 psi and temperatures to 150 F, the valve is furnished tapped for either ⅛ or ¼-in. pipe connections. It is rated at 300 cpm for continuous operation and up to 700 cpm for intermittent service on air at 120 psi.

Available in NO or NC 3-way designs at $29.50 each, or with 4-way action at $34.50 each, the valves can be manifolded together without special parts.

Hunt Valve Co, Inc, Salem, Ohio

MORE DATA? Circle 90, inside back cover



Adjustable Speed Drive Available in Ratings of 10 to 200 hp

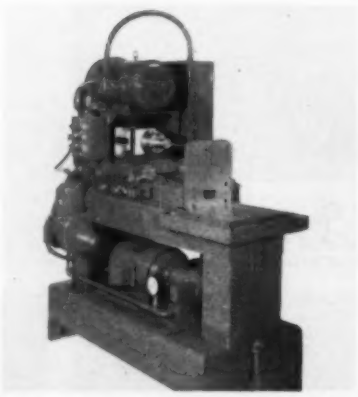
PAR-matic adjustable speed drive features power amplistat regulation. The flexible 5% regulated drive unit is ideally suited for a wide variety of industrial applications — ranging from machine tools to pumps and conveyors. Available in ratings of 10 to 200 hp, unit operates from standard 440-v, three-phase, 60-cycle industrial power. Packaged drive unit consists of a compact amplistat controller, standard dc shunt-wound drive motor, and an operator's remote control station.

Long life and greater reliability are assured because the static power unit has no moving parts. Standard units operate over a speed range of 10:1 with constant torque load.

An extended range for constant horsepower is available with modifications. Compact design reduces floor space requirements.

General Electric Co, Schenectady 5, NY

MORE DATA? Circle 91, inside back cover



Gun Drilling Machine Has Spindle Speeds of 250 to 10,000 rpm

Designed for deep hole drilling operations, this machine has spindle speeds of 250 to 10,000 rpm and spindle feeds from 0.3 to 40 ipm. A rapid traverse of 225 ipm is provided in both directions.

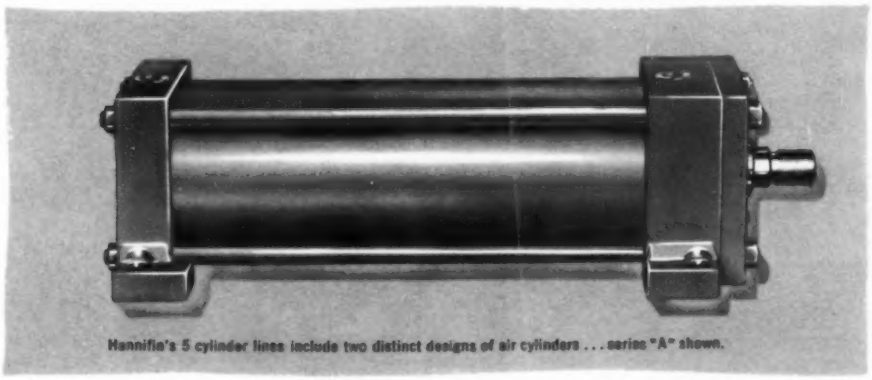
Machine base houses the coolant settling and supply tanks. Coolant pump has a capacity of 10 gpm at 1000 psi.

Cycle consists of rapid advance of tool to work, reduction of feed rate to the desired drilling rate, feed through the work, withdrawal at rapid traverse, braked stop. If a hard spot is encountered, the feed will slow down temporarily then pick up smoothly to normal speed when spot is passed.

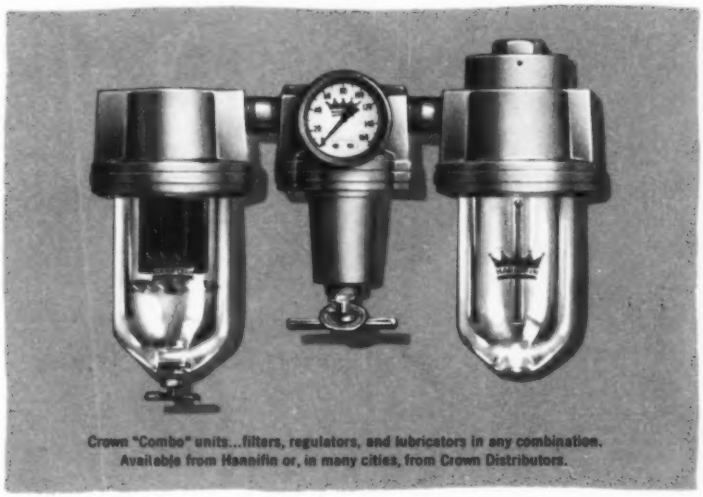
Gerrad Co, 10819 Copeland Ave, Box 26, Hales Corners, Wis

MORE DATA? Circle 92, inside back cover

PARKER-HANNIFIN FLUID-SYSTEM COMPONENTS



Hannifin's 5 cylinder lines include two distinct designs of air cylinders . . . series "A" shown.



Crown "Combo" units...filters, regulators, and lubricators in any combination. Available from Hannifin or, in many cities, from Crown Distributors.

Only HANNIFIN makes all these AIR POWER COMPONENTS

Hannifin valves take many forms. This ⅜" 4-way valve can perform many a controlling job.

Anywhere you use compressed air to do work, Hannifin can help you. Hannifin cylinders for the "muscles". . . Hannifin air valves for any type of actuation, hand, foot, cam, solenoid, or pressure . . . the Hannifin "Crown" Line of filters, regulators, and lubricators for lasting air power efficiency . . . all are built by Hannifin to just one standard, the best.

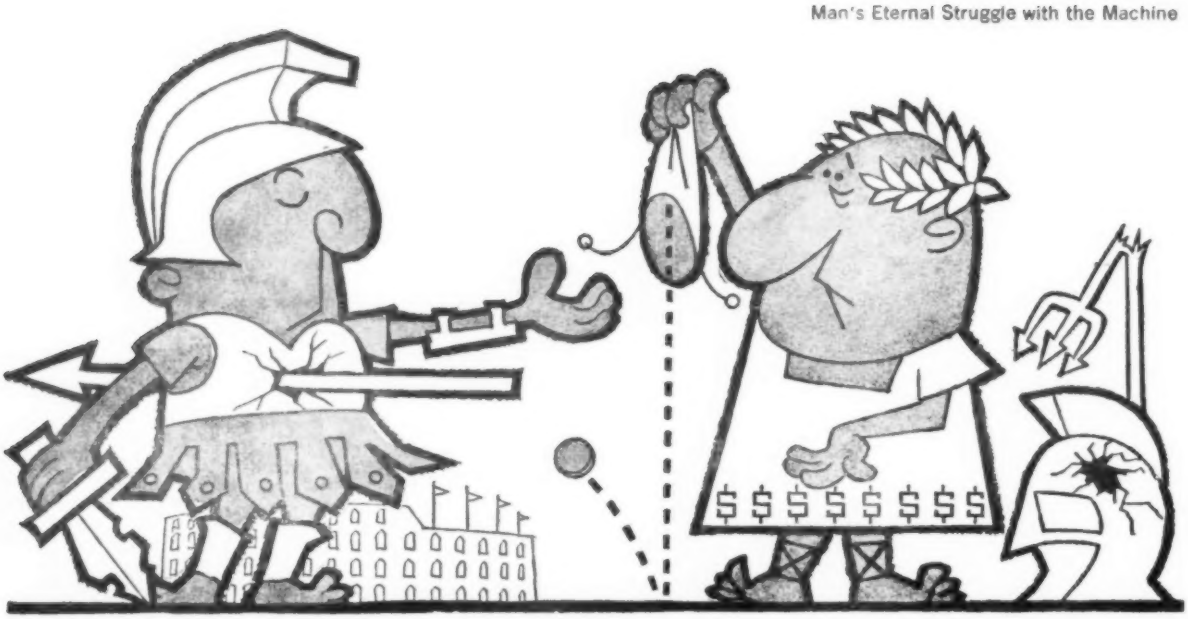
Turn to Hannifin, too, for expert help in applying air power components. A Hannifin field engineer is as close to you as your telephone, wherever you are. Write us for his address—or, he's listed in the alphabetical section of Thomas Register. It's that easy.

HANNIFIN COMPANY

505 South Wolf Road • Des Plaines, Illinois

A DIVISION OF PARKER-HANNIFIN CORPORATION

Man's Eternal Struggle with the Machine



WITH ALL THE COSTS OF DOING BUSINESS RISING STEADILY, PROFIT IS MORE ELUSIVE THAN EVER!

How long can the cost of "getting new equipment to work right" be buried in overhead?

No matter how attractive the original price of the equipment, it's false economy if the price tag *did not* itemize the extra money required to get it into production!

To your great responsibility for improving manufacturing processes has been added an *extra* concern for that old standby, catch-all type goodfellow called "overhead".

Overhead can no longer afford the labor and hard, cold cash-money often needed to make new equipment operate properly.

Sciaky knows about "overhead", too. That's why Sciaky resistance welding and production equipment is built to satisfy the requirements of *your* particular application. That's why Sciaky equipment is thoroughly tested and proved to do that particular job *before shipment.*

The result protects the profit your manufacturing operations can earn by (1) providing only the right equipment at the right price, (2) minimizing the lost time and cost of production try-out, and (3) minimizing rejects and costly re-working.

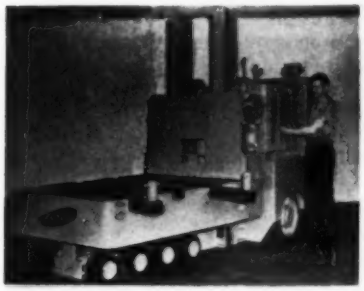
Why take less than the full advantage of consulting with a Sciaky Application Engineer the next time you are considering equipment. No obligation, of course.

A successful manufacturer of double-bowl kitchen sinks took that advantage. As a result, they replaced the previous high-reject, unprofitable method of fabrication with Sciaky resistance welding equipment. Within only ten days of installation, over 10,000 sink units were produced with less than a 1% scrap factor. Write for "Resistance Welding At Work", Volume 4-No. 6 for the details.

SCIAKY

68A

SCIAKY BROS., INC., 4933 W. 67th STREET, CHICAGO 38, ILLINOIS • POrtsmouth 7-5600



Die-Handling Truck Introduced In 20,000-lb Capacity Model

Model E12-20 SER can position dies on or off either side (as well as the end) of its platform, which permits stationing the vehicle parallel with the press in narrow aisles. Truck has been designed to handle Kirksite dies.

Stabilizer bar, easily pushed out from either side of the platform to be butted against the press, minimizes lateral truck deflection. Truck is equipped with remote controls to permit the operator to accurately position dies while standing at either side of the truck, as well as in the normal driver's position.

Elwell-Parker Electric Co, 4205 St Clair Ave, Cleveland 3, Ohio

MORE DATA? Circle 93, inside back cover

Tinning solution, designated Instant Tin, applies a workable deposit of tin to brass and copper articles. No current, heat or equipment are required. The finish is an excellent aid to soldering and acts as protection against atmospheric corrosion. A heavier coating can be obtained if immersion times are increased. One gallon covers approximately 800 sq in. with a thickness of 0.0001 in. Price is $14.95 per gal.

Desert Laboratory, 17-312 N Indian Ave, North Palm Springs, Calif

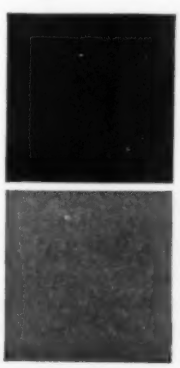
MORE DATA? Circle 94, inside back cover

Spring-loaded check valves, tradenamed Kep-O-Seal, are designed for hydraulic and pneumatic service. The flexible seal in the seating area will close around any dirt or foreign particles that may get into the line. Standard working pressure is 3000 psi hydraulic; standard temperature range, –40 F to +280 F. Wide variety of sizes and connection combinations available.

Kepner Products Co, 7343 West 59 St, Box 407, Summit, Ill

MORE DATA? Circle 95, inside back cover

SHOW STOPPER



It's the new Torrington Verti-Slide, the first major innovation in the field of 4-SLIDE equipment in 50 years!

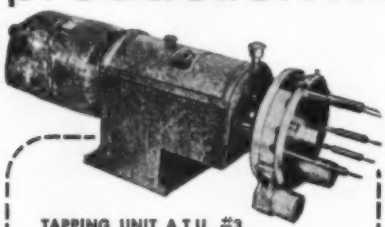
This machine was designed to meet a growing need for greater productivity and profitability in the cost-critical area of wire and strip forming.

Seldom before has a new machine created such immediate and widespread interest. We urge you to get the full story. Write or call today.

THE TORRINGTON MANUFACTURING COMPANY

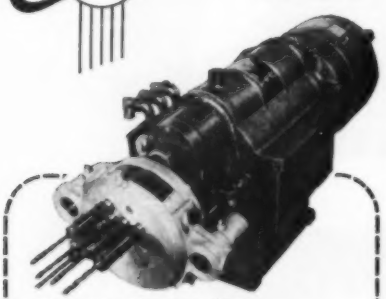
TORRINGTON, CONNECTICUT · VAN NUYS, CALIFORNIA · OAKVILLE, ONTARIO

The Tap and Drill Team for your hole production...



TAPPING UNIT A.T.U. #3
Completely self-contained all-electric lead screw precision unit. Quickly interchangeable for fast single or multiple spindle head operation. With forward and reverse electro-magnetic clutches and variable torque control.

Ettco-Emrick **TAP & DRILL TWINS**



DRILLING UNIT D.U. #2
Completely self-contained precision unit with powerful air feed and hydraulic control. Quickly interchangeable for fast single or multiple spindle head operation.

Used singly or in combination they offer the flexibility and adaptability to meet modern drilling and tapping requirements. When combined with Ettco-Emrick multiple spindle heads they'll set new standards of precision, speed and economy.

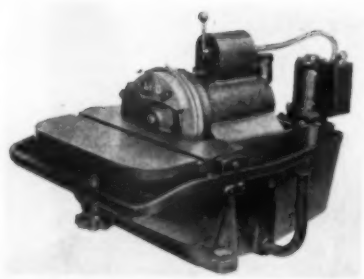
SPECIAL MACHINES
Building the Twins into high production special machines is simple, because all units are electrically controlled and all components are standardized equipment. We can supply the assembly complete with tooling — or you can do it in your own plant.

Write for details

Authorized distributors in U.S. and Canada

ETTCO TOOL & MACHINE CO., INC.
592 Johnson Avenue, Brooklyn 37, N. Y.
Chicago • Detroit • Los Angeles • Indianapolis

The only full line manufacturer covering the entire small hole field: Tapping Attachments • Multiple Heads • Drilling & Tapping Units and Machines • Special Machines • Indexing Fixtures • Tap & Drill Chucks



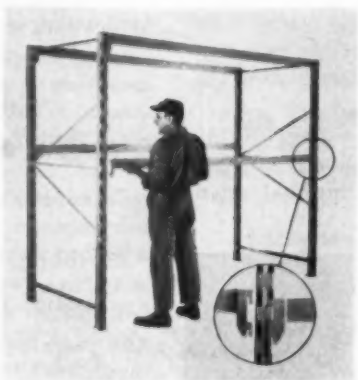
Grinding and Lapping Machine Has Automatic Oscillating Head

Bench Model GF-O is designed for use with the Wickman steel bonded diamond wheel. Reversible guard which gives maximum access to the wheel permits lapping of both RH and LH tungsten carbide tools. Because of oscillating motion of the head, operator needs only to hold the tool firmly on the table and press lightly on the cutting face of the diamond wheel to produce a perfectly straight edge at whatever rake is required.

Max tool height acceptable under the guard is 1¾ in. Machine is equipped with a 1-hp motor rotating at 2850 rpm; available in 200/220 or 400/440 v, 3-phase, 50 or 60 c.

Wickman Mfg Co, 10325 Capital Ave, Oak Park, (Detroit 37) Mich

MORE DATA? Circle 96, inside back cover



Adjustable Rack is Assembled Without Fasteners

Utilizing a positive wedge-locking principle, the FICO storage rack can be assembled rapidly to provide storage space for pallets, skids, barrels and many other products. Rack is assembled from two parts, a complete all-welded upright frame and a stringer which hooks into the rack. The stringers, made of standard structural shapes, are set between the uprights and provide a swayless rack, in any desired capacity.

The company supplies a survey form which permits customers to work out racks fitted to ther individual needs.

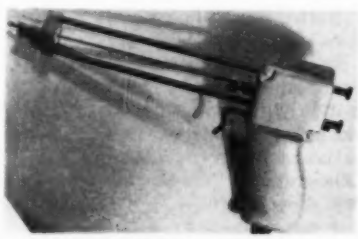
Midland Equipment Div, 485 South 21st St, Irvington, NJ

MORE DATA? Circle 97, inside back cover

Two-way solenoid valve, the general-purpose Shorty, is 4¾ in. high by 3 in. wide with height from top to line of 3 13/16 in. Applications are air and gases up to 250 psi; water to 150; oil to 75; and steam to 25. Units are available in four pipe sizes: ¼, ⅜, ½, and ¾ in.

Atkomatc Valve Co, 545 W Abbott St, Indianapolis 25, Ind

MORE DATA? Circle 98, inside back cover



Spot Panel Welder Offered For One-Side Welding

Spot welding from one side of the work without distortion or back-up can be accomplished with new unit designed for use with any welding machine, ac or dc, of 125 amps rating or more.

Special powdered-iron-coated welding rod with starting tip arcs immediately on contact with the work. Rods are available in 1/16 and 5/64-in. diameters. Buckling of panels is said to be practically nonexistent because unit uses low heat in an unusually small area. Small nose is supplied for greater convenience in close space welding.

Schott Metal Products Co, 2225 Lee Rd, Akron 6, Ohio

MORE DATA? Circle 99, inside back cover

Class 3 square head hydraulic cylinders (3000 psi) have been augmented with six new models and additional bore sizes. Line now provides a total selection of 19 basic mountings, or models, and bore sizes from 1½ through 12 in.

Galland-Henning Nopak Division, Milwaukee, Wis

MORE DATA? Circle 100, inside back cover

ECS

ELECTRONIC CONTROL SYSTEMS

LEADERS IN NUMERICAL CONTROL

S-C

STROMBERG-CARLSON

eliminate lead time problems

DIGIMATIC 202

POINT POSITIONING CONTROL SYSTEM

Move from drawing board to full production of parts overnight. Cut lead time through simplified drawing procedures, faster set-ups and elimination of jigs.

The Model 202 is an extremely reliable system comprising Control and Servo Positioning Table. Simple, compact Control design. All-enclosed Table mechanism. One day installation on existing machines. Creates new profits by reducing inventories, speeding engineering changes and beating schedules.

Adapts to any present point positioning type of machine tool ...drill, riveting machine, welder. 100 inches per minute feed rate. ±0.001-inch control accuracy, ±0.0002-inch control repeatability. Ideal for short runs.

Write for 12-page "Digimatic 202 System" Catalog.

ELECTRONIC CONTROL SYSTEMS
Division of
STROMBERG-CARLSON
DIVISION OF GENERAL DYNAMICS CORPORATION
2231 S. Barrington Avenue • Los Angeles 64, California

MARKING METAL?

Blaisdell Markers write on anything.

CHINA MARKER

Bold, bright marking for all slick surfaces — 14 vivid colors.

GET THESE BLAISDELL EXCLUSIVES

SPEE-D-POINT perforation for easy sharpening—STED-D-POINT staple for secure lead

DU-ALL MECHANICAL PENCIL

Marks all surfaces. Six colors with matching leads.

Write for sample naming this publication. Our many special pencils have solved varied marking problems since 1893. Let us help you.

TRADE MARKS REG. U.S. PAT. OFF.

BLAISDELL PENCIL COMPANY

BETHAYRES, PENNA.

FIELD REPORT...

Lockheed Aircraft Order

The Burbank, Calif, division has a contract in excess of $10 million from the Navy authorizing pre-production work on the P3V-1 Electra anti-submarine warfare patrol plane. Contract, covering "substantially increased" work during the next 12 months, will permit such manufacturing activity as production planning and master tooling layout.

Thompson Products' Merger . . .

. . . with Ramo-Wooldridge Corp, Los Angeles, became effective Oct 31 after virtually unanimous approval of stockholders of both companies. Corporate name is now Thompson Ramo Wooldridge Inc. Total employment of integrated company is in excess of 20,000; assets, more than $200 million; sales in 1958 in the estimated range of $300 to $325 million.

Hevi-Duty Electric Co. . . .

. . . has purchased the Stroman Furnace & Engineering Co from the Peterson Oven Division of Baker-Perkins, Inc. Addition of this line of furnaces will complement the furnace division acquired from Eclipse Fuel Engineering Co last July. All equipment formerly produced by Stroman will be manufactured in the new Hevi-Duty plant at Watertown, Wis.

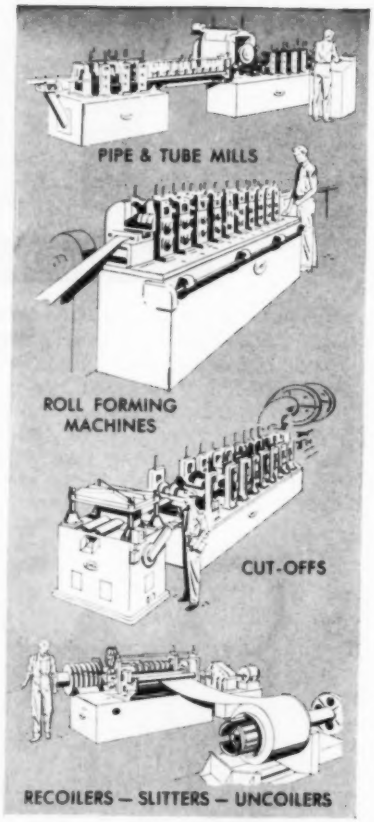
Armco Steel Reports . . .

. . . that all six of its open hearth furnaces at Butler, Penna, are operating for the first time since 1956. Total of 300 workers have been recalled recently.

45-Acre Industry Site . . .

. . . is in initial stages of development on Chicago's northwest side. District will provide sites for 15 to 20 manufacturing, warehouse, and office buildings. First building, al-

"Here's your trouble!"



YODER MAKES THEM ALL

. . . Complete equipment lines for heavy or light production!

Uncoilers, slitters, roll-forming machines, cut-offs, pipe and tube mills, special machinery for ferrous or non-ferrous metals are all made and engineered by Yoder to fit your specific requirements.

Special attachments and auxiliary units can perform additional operations such as welding, coiling, punching or embossing without extra labor cost while increasing production speed.

Let Yoder engineering and "know-how" help you get the most from your plant . . . with Yoder equipment. For full details, write to:

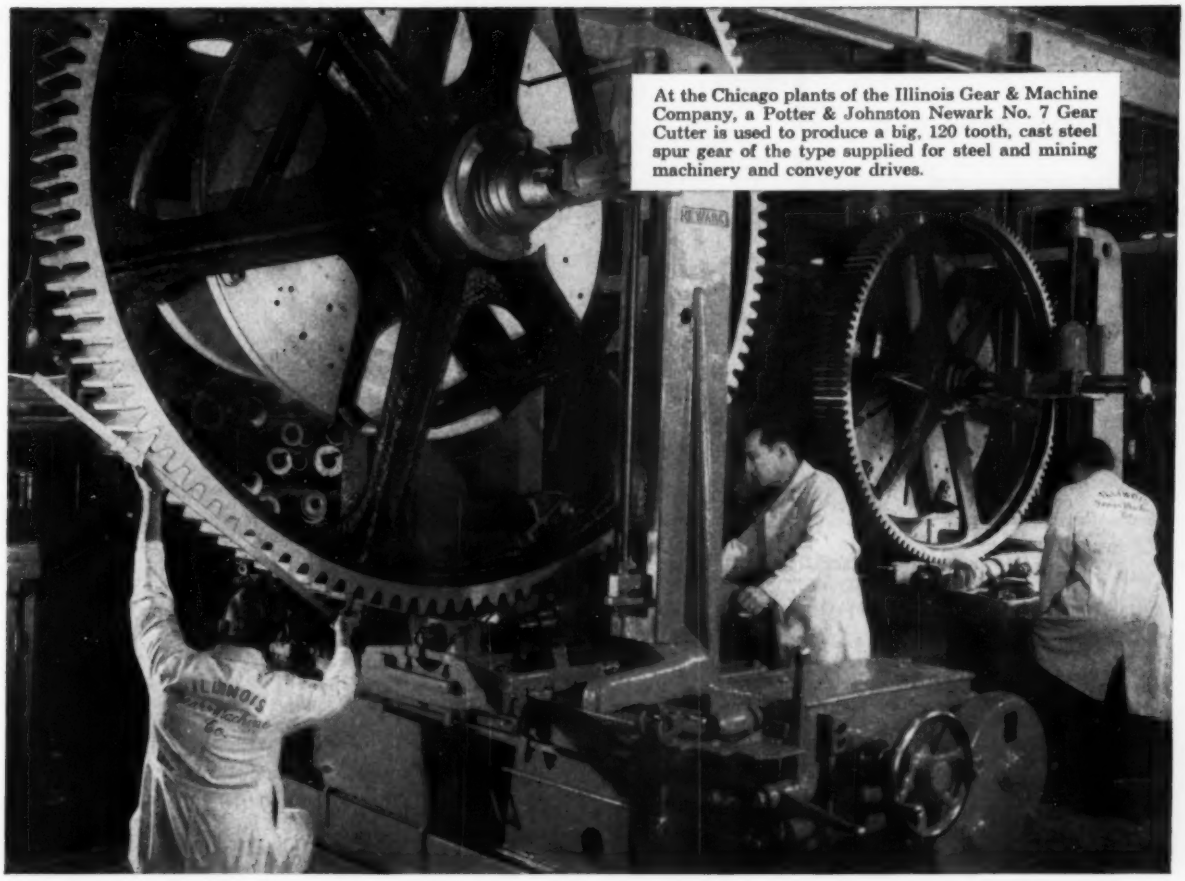
THE YODER COMPANY

5519 Walworth Ave. • Cleveland 2, Ohio

ENGINEERING YODER MANUFACTURING PIPE AND TUBE MILLS (ferrous or non-ferrous)

CIRCLE 289 READER SERVICE CARD

CIRCLE 290 READER SERVICE CARD



At the Chicago plants of the Illinois Gear & Machine Company, a Potter & Johnston Newark No. 7 Gear Cutter is used to produce a big, 120 tooth, cast steel spur gear of the type supplied for steel and mining machinery and conveyor drives.

For Speed . . . Accuracy . . . Economy . . .

ILLINOIS GEAR & MACHINE COMPANY USES NEWARK AUTOMATIC GEAR CUTTERS . . .

for spur gears with diameters ranging from ¾" to 126"

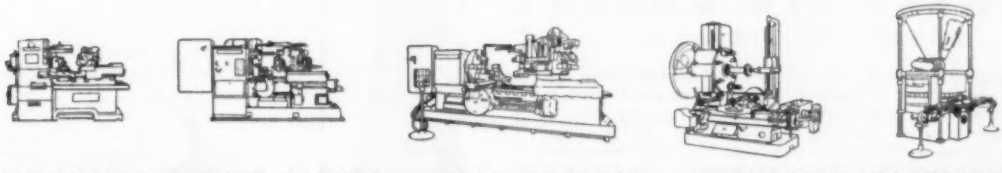
CHOICE OF THE SPECIALISTS WHO *KNOW*

. . . P&J-Newark Gear Cutters combine speed, accuracy, dependability and economy. Outstanding features include: power and rigidity for fast, heavy duty cutting; quick, easy machine setup; fully automatic operation that assures maximum output and lowest per-piece costs; and the exclusive Newark "Master Wheel" indexing mechanism, guaranteed for accuracy.

Available in four models with spur gear diameter capacities ranging from ¾" to 126".

SEND NOW FOR COMPLETE INFORMATION

. . . and see how a P&J-Newark can bring new efficiency to your gear cutting operations. Write now for your copy of Bulletin No. 157 . . . or to arrange for one of our representatives to visit you and provide facts and recommendations. Potter & Johnston Company, Pawtucket, Rhode Island.



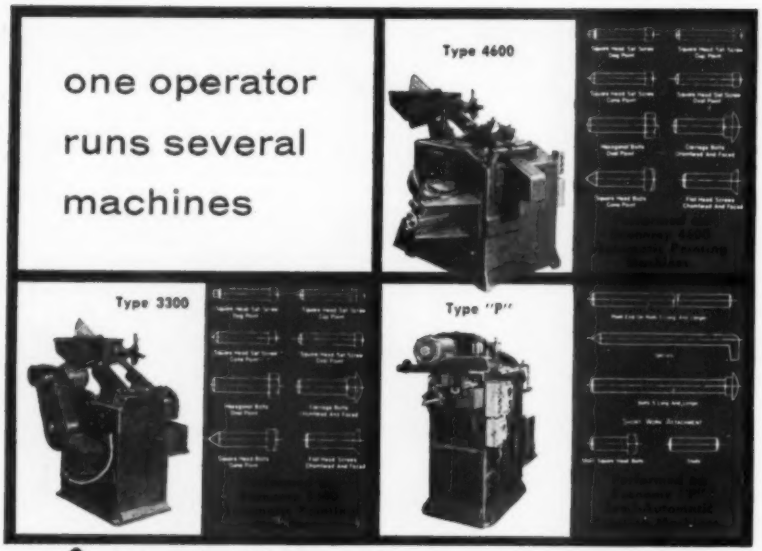
AUTOMATIC TURRET LATHES . . . GEAR CUTTERS . . . PACKAGING MACHINES

POTTER & JOHNSTON

SUBSIDIARY OF PRATT & WHITNEY COMPANY, INC.

PRECISION PRODUCTION TOOLING SINCE 1898

one operator runs several machines



Automatically **Point Bolts and Cap Screws on ECONOMY** *hopper fed pointing machines*

For more than 42 years, the Economy line of second operation machines has met with ever increasing acceptance by manufacturers in many fields of endeavor.

Increased production rates with reduced machining costs have transpired with the development of new machines.

The Automatic Pointers are available in two sizes — Type 3300 for uniformly pointing bolts and screws to ⅜" diameter and ¾" to 3½" in length, the Type 4600 for pointing bolts and cap screws, ¼" to ¾" diameter and 1" to 6" in length. A single machine will handle all types of points on many types of bolts and cap screws.

Production rates of the Type 3300 vary infinitely from 2000 to 6000 finished parts per hour and on the Type 4600 from 1800 to 5400 per hour.

Also available is the Type "P" Semi-Automatic Pointing Machine for pointing bolts, cap screws, studs and rods ¼" to 1½" diameter, 5" or more in length. Production rates up to 2000 pieces per hour make it a valuable secondary machine for short runs.

Consult ECONOMY on low cost, high production Bolt and Screw Pointing operations.

THE ECONOMY LINE

Automatic Shaving Machines
Automatic Pointing & Shaving Machines
Automatic Pointing Machines
Semi-automatic Pointing Machines
Automatic Pointing & Threading Machines
Double End Automatic Pointing Machines

THE ECONOMY ENGINEERING CO.
WILLOUGHBY, OHIO

WILLOUGHBY-OHIO

Designers and Manufacturers of Secondary Operation Machines since 1915

CIRCLE 292 READER SERVICE CARD

THE IMPROVED

LINLEY JIG BORER

Maximum Utility . . . At Less Cost!

Indispensable for the types of work that confront busy tool and model rooms. Accurate to a high degree yet simple and fast to operate, Linley Borers are low in initial cost, high in productivity; a truly versatile machine for all small part precision jig boring. Installed in your shop they will release costlier large capacity borers for heavier types of work. Table size: 7" x 17½" — table travel: 6½" x 10".

Complete specifications sent promptly on request.

LINLEY BROTHERS CO.
664 STATE ST. EXT. • BRIDGEPORT 1, CONN.

Field Report . . .

ready up, is a million-dollar structure housing the Chicago offices, warehousing, and repair facilities of De Laval Separator Co.

Erie Railroad Has Opened . . .

. . . its new $3.3 million car shop at Meadville, Penna. Furloughed employees have been called back to work on the first major maintenance program undertaken since the drop in freight business over a year ago. Schedule calls for a minimum of eight cars a day to be reconditioned at the shop.

$10 Million Contracts to Morse

Contracts adding up to over $10 million have been awarded to Fairbanks, Morse & Co. Orders include $8.8 million in defense and $1.4 million in civilian work. Most of the equipment provided in both types of contracts will be manufactured at the Beloit, Wis, works.

Titanium Castings . . .

. . . have been added to the line of mill products fabricated by Harvey Aluminum at its Torrance, Calif, plant. Company, one of two in the country capable of commercially producing such castings, is able to melt and cast titanium alloys without carbon or tungsten contamination, thereby improving ductility, reducing hardness, and making the cast parts easier to machine.

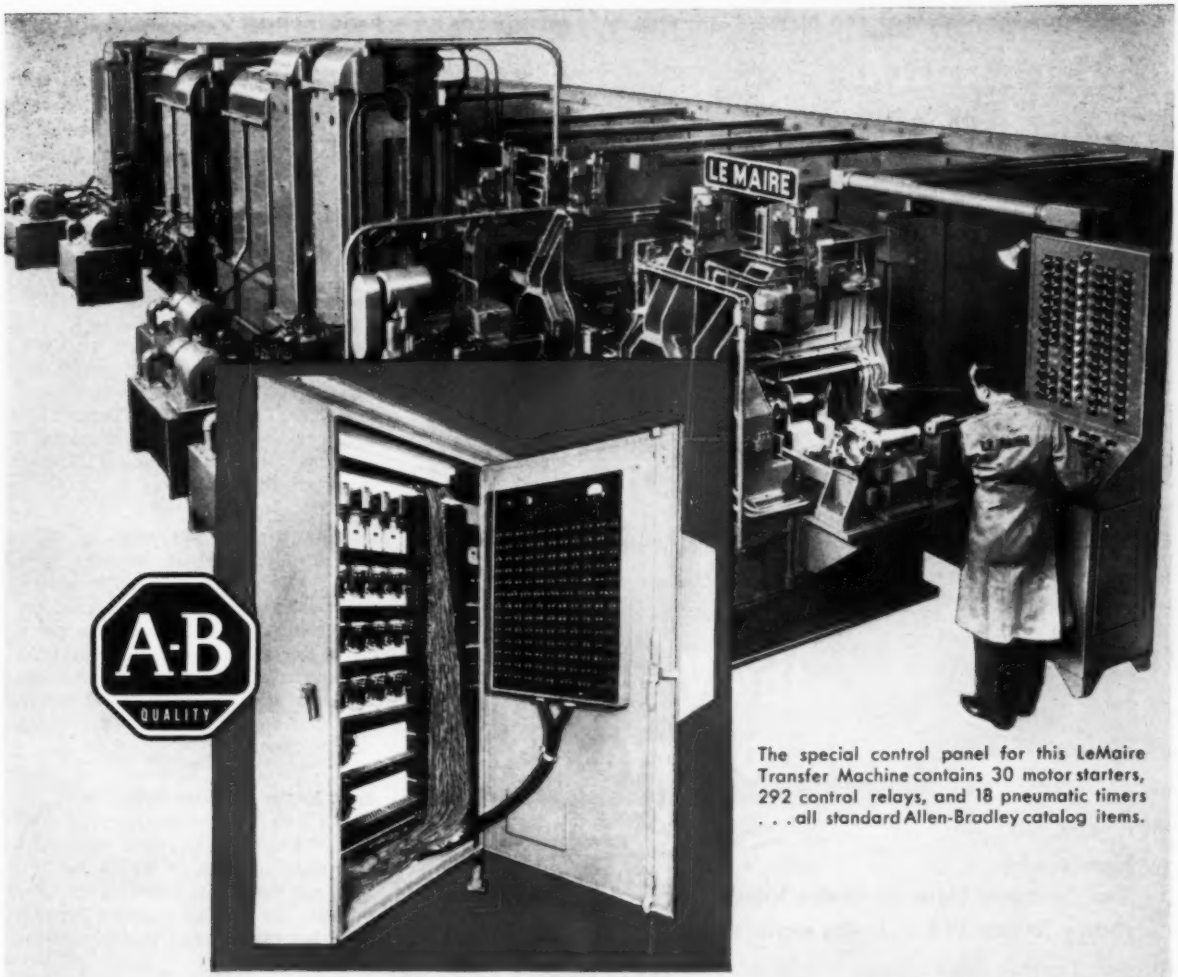
Philco Corp . . .

. . . has a $2.5 million contract from the Army Signal Supply agency to build eight new airborne radar systems developed by the company.

Seven Military Contractors . . .

. . . have banded together to form a systems management team to work with the Air Force in developing advanced effectiveness in a new early warning aircraft. Team consists of Lockheed California Division, sys-

"Well let me put it this way . . . If it was a horse, I'd shoot it!"



The special control panel for this LeMaire Transfer Machine contains 30 motor starters, 292 control relays, and 18 pneumatic timers . . . all standard Allen-Bradley catalog items.

LeMaire selects ALLEN-BRADLEY Quality Motor Control

Control panels are the "taskmasters" of modern automatic production machines . . . they must be dependable. And your *best* insurance against costly control failures is your insistence on Allen-Bradley . . . the motor control of *proven* reliability.

The simple solenoid design around which all Allen-Bradley relays, contactors, and starters are built has only ONE moving part. This eliminates trouble causing bearings and flexible jumpers . . . and assures *millions* of dependable operations.

In addition, the double break, silver alloy contacts —used throughout the Allen-Bradley line—never need servicing. They remain in perfect operating condition until completely worn away!

To maintain high efficiency production, specify the *best* in motor control . . . specify Allen-Bradley.

Allen-Bradley Co., 1310 S. Second St., Milwaukee 4, Wis.—In Canada: Allen-Bradley Canada Ltd., Galt, Ont.

Another automatic production machine "goes Allen-Bradley"

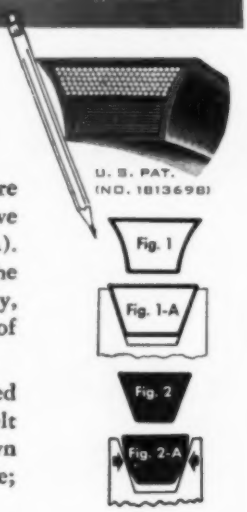
1st Choice of industry...

the V-belt with concave sides

Here's why:
The Concave Sides of Gates V-Belt *insure* longer life... lower costs

Try this. Bend a Gates V-Belt as if it were going around a sheave. Feel how the concave sides (Fig. 1) *fill out*... become straight (Fig. 1A). This precise fit insures full contact with the sides of the sheave... grips the sheave evenly, distributing wear uniformly across the sides of the belt. Uniform wear lengthens belt life.

Make the same test with a straight-sided belt (Fig. 2). Feel how the sides of the bent belt *bulge out,* concentrating wear at points shown in Fig. 2A. Uneven wear shortens belt life; increases costs.



Because Gates V-Belts with Concave Sides are so universally preferred, they are also the *most widely available.* Gates V-Belts are carried by leading distributors in industrial centers throughout the world.

The Gates Rubber Company, Denver, Colorado

Gates *World's Largest Maker of V-Belts* TPA 342

Gates VULCO ROPE Drives

Field Report . . .

tems manager; Allison Division of General Motors, engines; General Electric, radar; General Precision Equipment Corp, navigation; Hazeltine Corp, data processing and displays; Hughes Aircraft, communications and data link; and Lockheed Missile Systems Division, automatic checkout equipment.

National Steel Corp . . .

. . . has acquired from Crown Cork & Seal Co, Philadelphia, a cold reducing mill and supplementary equipment for the manufacture of electrolytic tin plate by National's Weirton Steel Division. Purchase price was $5.3 million.

Air Conditioning Systems . . .

. . . can be leased by industry from the Typhoon Air Conditioning Co, a Brooklyn division of Hupp Corp. Under the plan a business can get a complete system without investment in equipment or installation. Package units of 3 to 75-ton capacity can be leased for 2, 3, or 5 years with option to renew.

New North Carolina Industry

C P Clare & Co, subsidiary of Universal Products Co, has opened a $1.2 million plant at Fairview. It'll turn out electronic and related components for guided missiles, nuclear subs, computers, and communication systems.

Allis-Chalmers . . .

. . . has completed construction of new engineering, development, and research facilities in Greendale, Wis, about two miles south of the com-

"Notice a funny thing, Frisbee . . . while you were on vacation the reject rate dropped way down."

Should your GEAR DEPARTMENT be in Richmond, Indiana?

Today, that's a better question than ever. The current completion of 65% additional square feet of production capacity further improves our position to serve as your *gear department.* Many of our best customers use us in this manner with all of our facilities geared to their gear needs. Would you like to learn how successful these associations have been, and what a similar service might mean in terms of reduced costs and better gears?

If so, write. The man who responds to your inquiry will be a gear engineer.

EATON

AUTOMOTIVE GEAR DIVISION
MANUFACTURING COMPANY
RICHMOND, INDIANA

GEARS FOR AUTOMOTIVE, FARM EQUIPMENT AND GENERAL INDUSTRIAL APPLICATIONS
GEAR-MAKERS TO LEADING MANUFACTURERS

CIRCLE 296 READER SERVICE CARD

ONLY

GOSS and DeLEEUW AUTOMATIC CHUCKERS

offer the 1-2-3 feature

This NEW development—unsurpassed for speed, convenience of tooling and precise finish—involves no retooling problem even for short runs. It assures greater production at lower cost on all classes of work.

The unique "1-2-3" feature, exclusive with Goss & De Leeuw, provides the means for performing one to three right or left hand single or double threading operations simultaneously or in sequence, without changing set up.

Here's an ideal machine tool for small lot requirements because of quick, easy changeover. Any class of chuck work can be handled economically in any quantity.

The examples of work shown here are typical of the wider variety of parts being produced on these new machines.

SEND FOR detailed information on this new machine. Let us have samples of your work in order to give you time and cost estimates for handling it on the "1-2-3" Goss & De Leeuw.

GOSS & DeLEEUW

GOSS and DE LEEUW MACHINE COMPANY, KENSINGTON, CONN., U.S.A.

Field Report . . .

pany's West Allis Works. Among projects to be carried out will be design, construction, and testing of models, mock-ups, and prototypes of nuclear reactors and associated equipment.

Saco-Lowell Has Formed . . .
. . . a separate Automotive and Agricultural Parts Division to handle its growing business in that field. The Boston textile machinery manufacturer has been producing driveline and other chassis components for the past three years. The new division is operating from the Edwards plant at Saco, Me. Current products include such items as universal joints, heat exhaust valves, gears and gear cases, and axle and steering components.

GM Frigidaire Unit . . .
. . . is recalling 350 additional workers at the Dayton division plant. Number brought back since Aug 1 now totals 1600. Latest recall boosts total employment there to around 14,850.

Pratt & Whitney Has Opened . . .
. . . a new precision tool warehouse in Cleveland. A 4000-sq-ft building has been constructed adjoining the company's Sterling Die Division plant. Herbert Yankee, P&W vice president, and manager of Sterling Die, will be in charge of the operation. Plans are underway for a similar installation on the West Coast.

Florida Steel Corp . . .
. . . at Tampa, has turned out the first commercial steel ingot ever produced in the state. New plant, which uses a 15-ton-capacity electric furnace, will be in full production by Mid-November.

"Did you remember to tell your boss you were tired of working for chicken feed?"

Be Right . . . Buy Bearings By ALL the Numbers . . . from Bearings, Inc.

It is not enough to buy bearings by the bearing number alone! Those prefix and suffix numbers often determine bearing success or failure. Cost, too, is determined by those numbers for they show degree of precision, internal clearance and the amount of preloading.

How can you always make sure you get the right bearing for every application? It's simple! Contact our nearest branch and we will deliver bearings in the manufacturer's original sealed box. Every bearing is guaranteed by the maker and ourselves to be as specified on the box. Each bearing will be "factory-fresh" to give you best possible performance and life. Our representatives are qualified to assist in determining correct precision and fit on all bearings in your equipment.

Providing bearing service in the North ➤ **BEARINGS, INC.**

OHIO: Akron • Canton • Cincinnati • Cleveland • Columbus • Dayton • Elyria • Hamilton • Lima • Lockland • Mansfield • Toledo • Youngstown • Zanesville
INDIANA: Ft. Wayne • Indianapolis • Muncie • Terre Haute • **PENNSYLVANIA:** Erie • Johnstown • Philadelphia • Pittsburgh • York
WEST VIRGINIA: Charleston • Huntington • Parkersburg • Wheeling • **NEW JERSEY:** Camden
NEW YORK: Buffalo, Balanrol Corp. • **MARYLAND:** Baltimore • **DELAWARE:** Wilmington

and

in the South ➤ **DIXIE BEARINGS, INC.**

FLORIDA: Jacksonville • **GEORGIA:** Atlanta • **KENTUCKY:** Louisville • **LOUISIANA:** Baton Rouge • New Orleans
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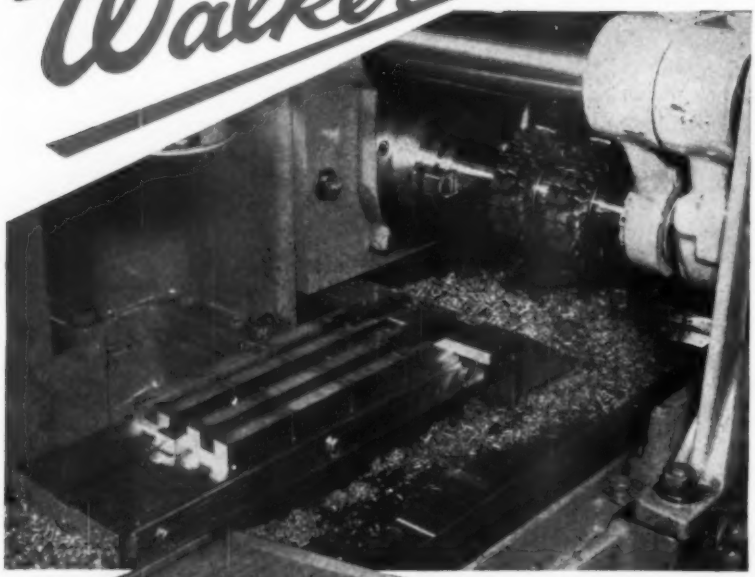
Walker



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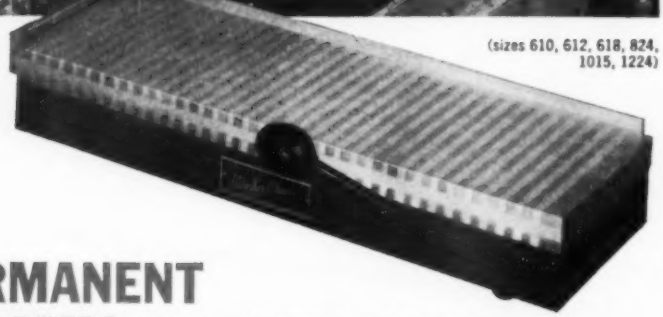


PERMANENT CERAMIC MAGNET CHUCKS

FOR GRINDING

- ¼" poles hold small and large work.
- All-steel top holds precision tolerances.
- Steel top means longer top plate life.

FOR MILLING

- Concentrated magnetic force for increased power.
- Automatic cutter demagnetization minimizes chip-adherence problem.
- Reduces costly loading time.
- Stress-free holding leaves more surfaces accessible for machining.

THE BEST —— WALKER

The new ultra-permanent ceramic magnets have three times the coercive force of metal magnets.

O.S.WALKER COMPANY, INC.

WORCESTER 6, MASSACHUSETTS, U.S.A.

The Original Designers and Builders of Magnetic Chucks

Field Report . . .

National-Standard Acquires . . .
. . . Cross Engineering Co, Carbondale, Penna, and will operate it as the Cross Perforated Metals plant. Acquisition marks the Niles, Mich, firm's entry into the perforated metal field and will supplement the line of screening material manufactured at its Reynolds Wire Division at Dixon, Ill.

GE's Computer Division . . .
. . . at Phoenix, Ariz, has developed a $43 million work backlog in less than three years. Established in 1956, the division has temporary plants in downtown Phoenix and northeast of the city, plus a computer center at Arizona State College at Tempe. A new 104,000 sq-ft plant in Deer Valley, north of the city, is expected to be ready for occupancy Jan 1.

Florida Firm Expanding
Radiation, Inc, Melbourne electronic company, reports that it will triple its size in the next five years. Expansion will be by internal growth as well as by acquisition of other firms in complementary fields. Present employment is over 800, and is scheduled to reach 2500 by 1963.

Jetronic Industries, Inc . . .
. . . Philadelphia electronics firm, has bought the Bayroad Maufacturing Co, metal fabricating plant in Miami. Earlier this year Jetronic acquired Centronix, Inc, a Coca, Fla, electronic research, development, and manufacturing concern. It now plans to move Centronix to the newly acquired facilities and to retain that name for the Miami operation.

Douglas Aircraft Will Supply . . .
. . . additional A4D-2 carrier-based attack bombers to the Navy under a new $26 million follow-on contract. The A3D series are built at the El Segundo (Calif) Division, and have been operational with the fleet since 1956. Order calls for deliveries in the summer of 1960.

Interstate Electronics Corp . . .
. . . Anaheim, Calif, has two Navy contracts totaling nearly $3 million for test and evaluation equipment associated with the Polaris fleet ballistic missile program. The first covers construction of additional instrumentation facilities at Cape Canaveral for evaluation of ground firing of the weapon. Second is for instrumentation to be placed aboard Polaris-firing subs.

Free Literature

To order any of these bulletins, circle corresponding number inside back cover.

MACHINES AND ATTACHMENTS

● EX-CELL-O GENERAL PRODUCTS CATALOG—*Ex-Cell-O Corp, 1200 Oakman Blvd, Detroit 32, Mich.* 88-page wire-bound catalog 27453 presents condensed description of products including its boring machines, custom and transfer machines, precision thread grinders, miscellaneous grinding machines and equipment, jet blade profiling and finishing machines, vertical contourers, vertical boring machines, plus data on precision spindles. Request direct on company letterhead.

1 DELTA POWER TOOLS—*Rockwell Manufacturing Co. Delta Power Tool Div, 497 N Lexington Ave, Pittsburgh 8, Penna.* 88-page catalog describing and illustrating complete line of power tools and accessories covers drillpresses, grinders, shapers, planers, jointers, metal and wood-cutting lathes, tilting arbor saws, unisaws, band and radial saws. Complete specifications included.

2 POWER PRESSES — *Johnson Machine & Press Corp, 620 W Indiana Ave, Elkhart, Ind.* 8-page illustrated catalog 1958-A gives complete detailed specifications on 40 models of flywheel and back-geared inclinable units from 16 to 150 tons; single and double crank straight side presses from 40 to 250 tons; gap presses from 60 to 200 tons; and horn presses in 35 and 60-ton sizes.

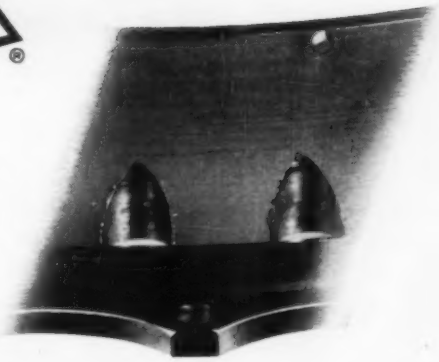
3 POWER TOOLS — *Boice-Crane Co, 935 W Central Ave, Toledo 6, Ohio.* 52-page catalog 59 presents illustrated descriptions of line of band, contour, and jig saws, band filers, saw jointers, saw tables, shapers and shaper cutters, drillpresses, tool and knife grinders, lathes, planers, belt and spindle sanders, spinning tools, motors, controls, supplies, and accessories.

4 HYDRAULIC PRESSES—*American Chain & Cable Co, ACCO Equipment Div, York, Penna.* 8-page bulletin DH-126 contains detailed data on line of manual and air-operated units ranging from a 3-ton mechanical arbor press to the 25, 40, 60, 80, 125, and 150-ton units. 13 models illustrated and described with capacities, dimensions, other specifications.

5 PLATE BENDING ROLLS—*Niagara Machine & Tool Works, 683 Northland Ave, Buffalo 11, NY.* 4-page illustrated

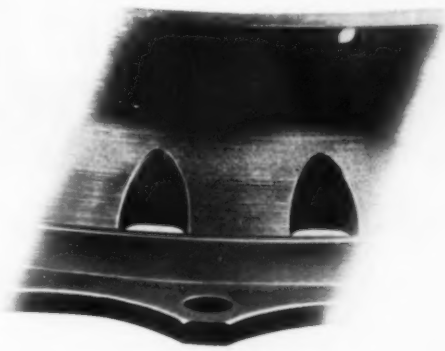
"No! Not another turnpike!"

OSBORN®



BEFORE BRUSHING

Jet engine part formerly hand-filed and emery-rubbed to remove burrs and sharp edges. *Hand-finishing time: 45 minutes.*

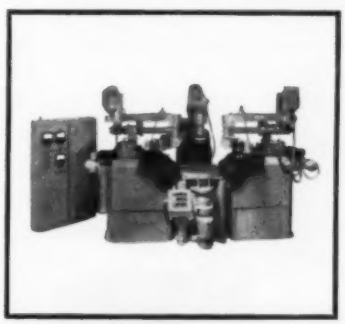


AFTER BRUSHING

Burrs thoroughly removed... edges and surface junctures blended to 6-8 microinches. Each part precision-finished quickly, uniformly. *Osborn Brushamatic® finishing time: 6 minutes.*

6 minutes to microfinish this jet engine part!

...it's 7½ times as fast with OSBORN Brushamatic® Methods



THESE JET ENGINE PARTS are microfinished at low cost, automatically—at high production rates on Osborn Brushamatic® 51-3L Machine. Three Osborn Fascut® brushes (with compound) operating at 1750 rpm do the job.

IT used to take 45 minutes to hand-finish this precision jet engine component. *Today, this leading jet engine manufacturer does the job in just 6 minutes with Osborn Brushamatic® Methods. It's 7½ times as fast and results in significant dollar savings.*

Slow hand-finishing still left scratch marks to cause possible stress fractures. But, rapid Brushamatic® finishing produces a *precision 6 to 8 microinch surface* . . . automatically removes burrs . . . blends sharp edges and surface junctures.

Result: a fast, economical, precision Brushamatic® finish that reduces stress concentration areas. Uniform, high-quality parts are produced at high production rates.

It's typical of how Osborn Power Brushing works to help you speed production . . . cut costs . . . improve product quality. An Osborn Brushing Analysis, made in your plant at no obligation, will show you how. Write or wire us for details —and for your copy of the 20-page Brushamatic® booklet. *The Osborn Manufacturing Company, Dept. C-77, Cleveland 14, Ohio.*

Osborn Brushes

BRUSHING MACHINES • BRUSHING METHODS
POWER, PAINT AND MAINTENANCE BRUSHES • FOUNDRY PRODUCTION MACHINERY

"Get rid of that DUST!"

"The boss was sore and I was on the spot.

"He shoved the report from the efficiency engineer at me. I read it: 'Yearly loss due to machine wear, misalignment and down time . . . $3,000. Major cause . . . abrasive dust.'

"The boss pointed his finger at me, 'Get rid of that dust and get rid of it fast!' "

Now, it was my problem, and I was on the spot.

"First thing I did was to check into a central dust collecting system. But the lowest bid I could get was $8,000. Too much.

"Then I came across a Torit ad, offering economical portable dust collectors.

"Two days after my call Torit engineers showed me how in only one week they could install a portable, unitized Torit Dust Collector at each of our eight grinders, trapping dust right at its source—cleaning the air throughout the entire plant.

"Total cost? Only $2400.00. That's a $5,600.00 saving over the lowest priced central system.

"You guessed it—we installed the eight Torit Collectors."

Torit solved my problem

"This year when we received our report it read: 'Loss due to machine wear, misalignment and down time...$340.00.' A saving of $2,660.

"This time the boss was all smiles. He slapped me on the back, 'Charlie, you did a fine job getting rid of that dust. Frankly, I didn't think it could be done with such a small investment.'

"Now there's a pretty nice fellow to work for.

"If you've got a dust problem, or are about to have one, write the Torit people. They've manufactured and sold more dust collectors than anyone else in the U.S.A. Chances are they can help you the way they helped us."

TORIT manufacturing company
311 Walnut Street, St. Paul 2, Minn., Dept. 411

Free Literature

To order any of these bulletins, circle corresponding number inside back cover.

bulletin 77E supplement provides information on 9 and 10-in. diameter rolls with finger-tip control. Design features described; specifications cover six models available in both series. Working lengths are up to 168 in. and capacities to ¾-in. mild steel.

6 TUBE FLARING MACHINE—*Automation Associates Inc, 1444 E 11 Mile Rd, Madison Heights, Mich.* 4-page bulletin 581 pictures and discusses features of high-speed Model C-2 with capacity of ⅜-in. 0.035 steel tubing, 180 spm (2 strokes per flare). Also described is Model 2 automation unit, an air-operated parts loader and unloader, designed for attachment to the machine.

7 UNIVERSAL DIAGONAL GEAR SHAVING—*National Broach & Machine Co, 5600 St Jean, Detroit 13, Mich.* 8-page bulletin gives details on Red Ring Model GCU capable of conventional as well as diagonal method of shaving. Typical parts produced are illustrated, as well as design features of machine, available in three models: 8, 12, and 18-in.

8 CUTOFF SAWS—*Wallace Supplies Mfg Co, 1304 Diversey Pkway, Chicago 14, Ill.* 36-page illustrated catalog pictures and describes line including combination abrasive cutoff and deburring chop saw; modular abrasive cutoff saw (capacity 6-in. standard pipe); swing-type abrasive cutoff saw for high production work; rotating abrasive cutoff saw (capacity 24-in. standard pipe); the See-Saw, a new oscillating abrasive wet or dry cutoff saw for cutting large sections; plate abrasive cutoff saw.

9 MACHINE TOOLS—*Morey Machinery Co, 383 Lafayette St, New York 3, NY.* 32-page catalog 1157 illustrates and provides brief description of wide lines of used and rebuilt machine tools for cash, credit, rental, or trade-in.

TOOLS AND ACCESSORIES

10 INDUSTRIAL TOOLS AND SUPPLIES—*Garrett Corp, 9851 Sepulveda Blvd, Los Angeles 45, Calif.* Hardcover catalog, over 100 pages, contains illustrated descriptions of more than a hundred "Famous Brands" of abrasives; precision, hand, electric and air tools; power transmission equipment; cutting tools; and shop supplies distributed by Garrett Supply and its subsidiary, C W Marwedel. Thumbcut sectionalized index lists items under manufacturers' names as well as under type of tool.

"I wouldn't call your machine that, Chip! Where's your respect for old age?"

11 SHELL END MILLS—*Sandvik Steel, Inc, 1702 Nevins Rd, Fair Lawn, N.J.* Illustrated technical bulletin gives complete details on Coromant S26 and S27 carbide-tipped units. Dimensional and cutting angle data is provided on three sizes of S26, designed for square shoulder milling and for low cutting pressures, and for S27 for heavy duty face milling. Tables and graphs give recommended cutting speeds and feeds for various metals.

12 AIR VISES — *Heinrich Tools Inc, Racine, Wis.* 4-page brochure describes complete line for automatic, self-centering operations within tolerance of 0.001 with holding power to 4000 lbs at 100 psi. Includes specifications table on all models. Custom-made special-application units pictured.

13 ELECTRON OPTICAL INSTRUMENTS—*Philips Electronics, Inc, Instruments Div, 750 S Fulton Ave, Mount Vernon, NY.* 16-page booklet RC 178A contains engineering data on Norelco instruments. Separate sections cover the EM-100B and EM-75B electron microscopes, the PMR X-ray microscope, and the CMR contact microradiographic unit.

14 THERMOCOUPLES — *Bristol Co, Waterbury 20, Conn.* Illustrated bulletin P1281 contains description and specifications of new Armorox units. Available types, materials, sizes, and thermocouple curves are detailed, and applications for which these instruments are especially recommended are suggested.

15 PIERCE NUT UNITS—*Wales-Strippit, Inc, 200 S Buell Rd, Akron, NY.* 4-page illustrated catalog describes units for staking Fabristeel nuts into sheet metal for assembly panel production. Operation and specifications of the press-actuated Type CD and BL models for short, medium, and long runs of nut insertions are covered, including flat and embossing dies and sizes and threads of Multipierce nuts available for the units.

16 BUFFS—*Divine Brothers Co, Seward Ave, Utica, NY.* 8-page bulletin contains illustrated data on Red-D-Vent air-cooled metal center buff. Specifications, construction details, comparisons between it and other types of buffs included.

17 AUTOMATIC PARTS FEEDER—*Radio Corp of America, Industrial Electronic Products, Camden 2, NJ.* Illustrated brochure covers non-mar feeder-orientors for handling fragile and highly finished parts; elevating oriented feed hoppers; stack feeders; and rotary hoppers. Also described are automatic high-speed hardness testers; inspection machines; grinder controls; and other products of RCA's Automation Equipment Section.

18 TEST EQUIPMENT—*Simpson Electric Co, 5200 W Kinzie, Chicago 44, Ill.* 8-page bulletin 2060 covers complete line including volt-ohmmeters, vacuum tube volt-ohmmeters, microtesters.

19 ALL-PURPOSE GREASE—*Imperial Oil & Grease Co, 6505 Wilshire Blvd, Los Angeles 48, Calif.* Brochure describes properties and applications of Molub-Alloy grease. Small sample tubes are available with the literature.

HEAT TREATING AND WELDING

20 ELECTRIC FURNACE—*C I Hayes, Inc, 810 Wellington Ave, Cranston 10, RI.* Bulletin 5711B describes design features of LAC-50M conveyor unit for alloying transistors and diodes, for metal bonding and soldering, and similar applications. Gives details on various components and control equipment, shows heat control curves.

21 AUTOMATIC WELDING WIRE—*Page Steel & Wire Div, American Chain & Cable Co, Monessen, Penna.* 4-page bulletin DH-402B presents data on

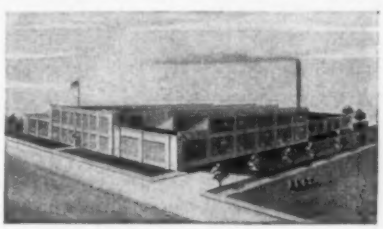
CDT can help you cut costs

CDT CAN INCREASE YOUR PRODUCTION
. . . because CDT specializes in designing and building tools and machines for today's high production demands.

CDT CAN IMPROVE YOUR QUALITY
. . . because CDT tools, jigs, fixtures and machines are precision engineered and built to the strictest requirements.

CDT CAN LOWER YOUR PRODUCTION COSTS
. . . by increasing the efficiency of your operation with special tools that do the job better—faster—more economically.

Call on Columbus Die-Tool for your special tooling problems. A large creative engineering staff with experience in developing special tools and machines for hundreds of industries is at your service. Over 50,000 square feet filled with precision production equipment enables us to build fine tools and special purpose machines to exacting requirements. Avail yourself of the industry-wide experience of Columbus Die-Tool.



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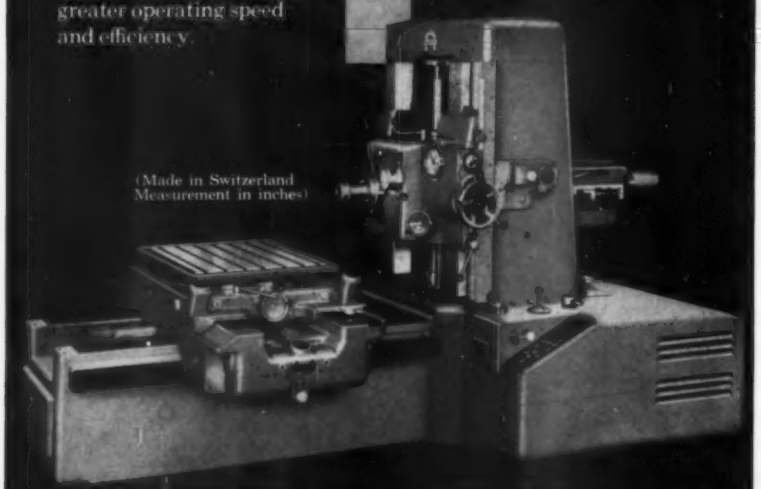
the DIXI 75

gives you horizontal optical jig boring

- Projected optical setting—direct reading to .00005" for linear motions and 1 sec. of arc for built-in rotary table. Linear optics provided with adjustable zero reference.
- 3" diameter boring spindle
- Increased capacity: table size 39⅜" x 32"; 29⅝" cross travel; 23⅝" longitudinal travel; 25⅝" vertical travel

PLUS...

- Automatic positioning device available.
- Simplified controls functionally arranged for greater operating speed and efficiency.
- Hydraulic feeds and infinitely variable spindle speeds.
- Rear support optional.



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MBI has engineers available for consultation, guarantees service by factory trained staff, and stocks spare parts in New York. — Join the long list of leading aircraft and manufacturing plants throughout the United States which are using the horizontal optical jig borer.

See the Dixi 75 at our Cleveland Demonstration Center (Sloan Machine Co., 18714 Nottingham Road, Cleveland, Ohio)

MBI

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Free Literature

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wire for inert gas and submerged arc welding. Includes analysis of various stainless steel, low alloy, and mild carbon steel welding wires.

22 SUBMERGED ARC TANDEM WELDING — *Lincoln Electric Co, Cleveland 17, Ohio.* 4-page bulletin 5200.2 give details and outlines advantages of multiple electrode submerged arc tandem welding over single arc operation. Describes process, applications, requirements; illustrates and discusses commonly used equipment arrangements.

23 ELECTRIC RESISTANCE MATERIAL — *Kanthal Corp, Stamford, Conn.* 15-page booklet contains technical data on Kanthal-Super material for temperatures of 1600 C (2900 F) produced in the form of rods of circular cross section which, when heated, can be formed into suitable heating elements.

24 PRECIOUS METAL BRAZING ALLOYS—*Western Gold & Platinum Co, Belmont, Calif.* 5-page bulletin V-124 describes complete line of Wesgo ultra high purity, low vapor pressure brazing alloys for vacuum systems. New products discussed are Paloro, Nicoro 80, and Nicusil 3.

PLANT SERVICE EQUIPMENT

25 TUMBLING MEDIA—*Carborundum Co, Electro Minerals Div, Niagara Falls, NY.* 20-page illustrated booklet discusses kinds of media; types of applications; types and functions of tumbling barrels; fixturing and lining; compounds and cleansers; do's and don'ts on use of water; analyses of typical jobs.

26 SPRAYED COATINGS—*Metallizing Engineering Co, 1101 Prospect Ave, Westbury, LI, NY.* 8-page illustrated bulletin 136A contains basic engineering data on wire and powder sprayed coatings of metals and ceramics. Covers characteristics, including hardness, tensile and bond strength of various coatings, plus wide range of mechanical and electrical-electronic applications, and variety of equipment.

27 MATERIALS HANDLING EQUIPMENT—*Lewis-Shepard Products, Inc, 125 Walnut St, Watertown 72, Mass.* 4-page booklet describes methods of leasing equipment. Three plans include lease option,

". . . Put it on the tab—we want to develop this idea further!"

straight or true leases, and "Power Package" leases that allow user to lease the battery and charger for his electrically powered fork lift trucks.

28 MECHANICAL DRAFT FANS—*Westinghouse Electric Corp, Sturtevant Div, 200 Readville St, Hyde Park, Boston 36, Mass.* 8-page illustrated catalog 1361 provides information on Series 7000 centrifugal fans for handling abrasive gases at elevated temperatures. Application, performance, and physical data given, as well as list of accessories.

29 LIGHTING FIXTURES—*Adjustable Fixture Co, 104 E Mason St, Milwaukee 2, Wis.* 12-page catalog 66 describes complete line. Lamps and accessories illustrated; dimensions and applications included.

30 BARREL FINISHING COMPOUNDS—*Oakite Products, Inc, 124 Rector St, New York 6, NY.* 8-page booklet discusses necessity for correct combination of media, solution, speed, and loading. Contains data on how to preclean parts; how to select media for specific metals, shapes, and sizes of parts; operations to be performed; and finishes desired. Compounds discussed include alkaline and acidic, abrasive and non-abrasive.

31 AEROSOL SPRAY PRODUCTS—*Crown Industrial Products Co, 1009 Amsterdam St, Woodstock, Ill.* 16-page illustrated booklet describes complete line including Rust Inhibitor, Kleer Kote Plastic Spray, Tool Maker's Ink and Cleaning Oil, Lubricating Oil, Heavy Duty Wire Rope Lube, Multi-Purpose Grease, Color Code Paint, Maintenance and Touchup Paint, Zinc Chromate Primer.

32 INSULATION ADHESIVES—*Insul-Coustic Corp, 48-23 54th Rd, Maspeth 78, NY.* Bulletin I-C 58 contains information on line of white and colored coatings and adhesive coatings; asphalt and aluminum-asphalt weatherproofing; high-temperature adhesives; non-shrinking vapor-sealers; high pressure joint sealers; and fire-retardant vapor barriers. Applications, properties, temperature ranges, selection data included.

PARTS AND MATERIALS

33 AIR CYLINDERS—*Lynair Inc, 2100 E Michigan, Jackson, Mich.* 24-page catalog SA7 illustrates and describes Square Air, Airdraulic, Air Booster, and Low Pressure Hydraulic Units, non-rotating, double acting, 200 psi air or oil. Detailed specifications.

34 WALL CHART OF STEEL TYPES—*LaSalle Steel Co, PO Box 6930-A, Chicago 80, Ill.* 11 x 17-in. chart lists all AISI grades of cold finished steel bars. This 5-page comparison chart lists 241 grades of steel bars with chemical analysis and machinability ratings. In addition to specialty steels, chart covers 8 AISI grades of screw machine steels, 25 AISI grades of resulfurized carbon steels, 64 AISI grades of open hearth steels, and 140 grades of alloy steels. Table gives weights in pounds per foot for round, square, and hexagon steel bars of thicknesses or diameters from 1/32 to 6 in.

35 VARIABLE PITCH DRIVES—*Browning Manufacturing Co, Maysville, Ky.* 11-page catalog V-183-B describes complete line, illustrates construction features, includes detailed tabular data covering dimensions, PD ranges, and prices.

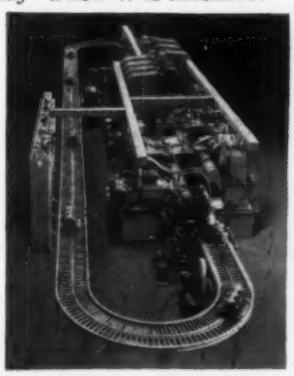
36 AIR CLUTCHES—*Conway Clutch Co, Cincinnati 25, Ohio.* 8-page bulletin 858 gives details on Stationaire units features of which include stationary air housing; interchangeability with mechanical clutch applications; one basic drive for 6 different applications; no rotating union needed; elimination of shaft drilling operations; middle-shaft mounting if desired; can be used as double clutches.

STEEL *from Wheelock, Lovejoy* BULLETIN

W-L DETROIT For the first time, HY-TEN D-2 air hardening steel now available here in rounds, squares, flats and billets. Also a fine stock of standard alloy grades, especially A-8620, as well as all HY-TEN grades. Excellent service from our new warehouse.

W-L CHICAGO Steady demand for "B" No. 3X for flame-hardened parts such as boring bars. Good stocks of HY-TEN AIS — the best carburizing alloy steel, and freest machining available today—a new W-L exclusive!

W-L CINCINNATI This 23-station Avey Line-O-Dex transfer machine, designed and built by The Avey Division of Motch & Merryweather Machinery Co., Cincinnati, Ohio, is equipped with spindles made of our HY-TEN "B" No. 2. This grade was chosen for its great tensile strength (100,000 P. S. I. in the natural condition), toughness, and fine wearing qualities.



W-L CAMBRIDGE We are now distributing FLEXANGLE, the easy-to-erect structure assembly for all types of racks, shelves, platforms, etc. It's completely universal and low in cost — can be used anywhere, by anyone, for any storage purpose.

W-L HILLSIDE Our stock of flat and square sizes in HY-TEN M Temper Oil Hardening Steel can save you time and money in your tooling program. HY-TEN "B" No. 3X pre-heat treated in rounds, squares and flats available in a wide range of sizes. Billets on hand for hammer forging in all grades of HY-TEN.

W-L CLEVELAND Excellent stock of brake die flats and squares. Also many sizes up to 16" x 18" in HY-TEN Mold Steel. Excellent deliveries.

W-L BUFFALO A wide range of rounds and hexagons in cold drawn AISI leaded and non-leaded A-4140. Also many sizes of the new "B" No. 3X-40 in rounds and hexagons.

Write our Cambridge office today for your *free* Wheelock, Lovejoy Data Sheets. They'll give you complete technical information on grades, applications, physical properties, tests, heat treating, etc.

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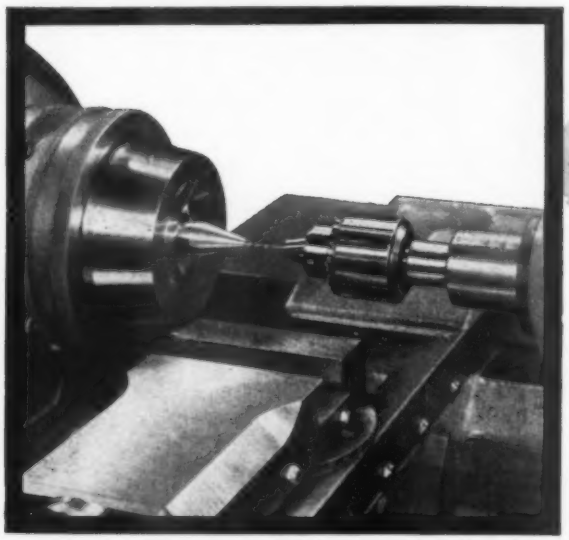
137 Sidney Street, Cambridge 39, Mass.

AMERICAN STEEL WAREHOUSE ASS'N

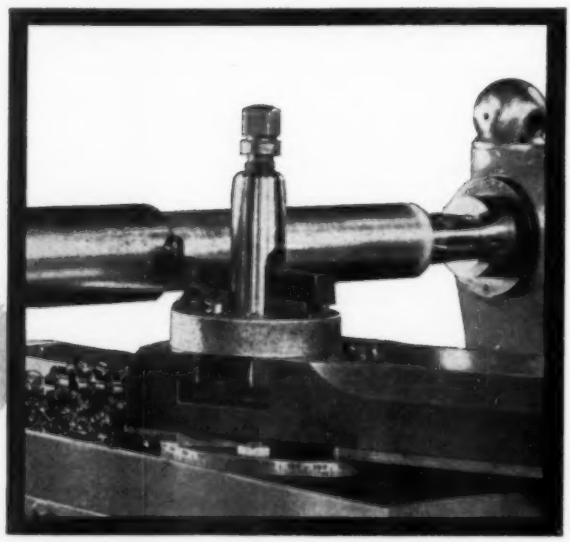
AGENTS: Southern Engineering Company, Charlotte, N. C.; Sanderson-Newbould, Ltd., Montreal & Toronto

Rivett's 2 for 1 Lathe!



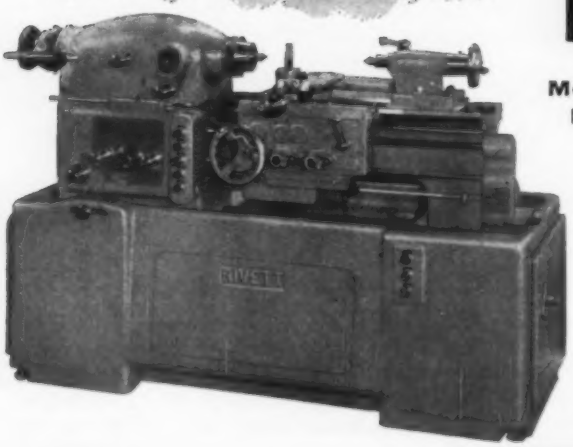
Sensitive...
As An Instrument Lathe

Responds to the lightest touch of the operator. Turns within .0004" in 12" length!



POWERFUL...
As An Engine Lathe

Full horsepower transmitted to spindle. Takes ¼" chip with .020" feed on cold rolled steel.



Model 1020S "Steelway"
PRECISION TOOLROOM LATHE

This lathe has the industry talking! Because of extreme precision, it has long been recognized as the top tool by master mechanics. Now, its adaptability and broad usefulness have highlighted its productivity. As one satisfied user states, "Our toolmakers go to a Rivett first in preference to our other lathes!"

RIVETT LATHE & GRINDER, INC.
Dept. AM-11, Brighton 35, Boston, Mass.

Go to Rivett now for information about this big, beautiful machine.
Send for bulletin 1020B.

RIVETT
"Steelway" Lathes

Dan W Burns (left) and **Robert T Campion** (center) have been elected vice presidents of the Siegler Corp, Los Angeles. Mr Campion will retain his post as secretary of the company. Mr Burns is president of the Hufford Corp, El Segundo subsidiary of Siegler, which manufactures special machinery for aircraft and missile firms. **Edward C Lindsay** (right) has been named vice president, manufacturing, for Hufford. Prior to joining the company Mr Lindsay was vice president, engineering sales, in charge of special process grinding machinery, Mercury Engineering, Milwaukee

NAMES IN THE NEWS...

Garvin A Drew has been appointed general manager of the Schrader Division of Scovil Manufacturing Co. Mr Drew has been sales manager of Schrader for 18 years and a vice president of Scovill since 1954. **Seldon T Williams,** Schrader's general manager since 1950, has been elected to succeed retiring **William M Goss** as president and general manager of Scovill. **Russell C Flood,** operations manager, has been named, in addition, a vice president of Scovill.

Arthur Raske Jr, executive vice president, has been named president of Nu-Matic Grinders, Inc, Cleveland manufacturer of finishing wheels.

Clare Engle has been appointed superintendent of manufacturing for the Hydreco Division of New York Air Brake Co, Kalamazoo, Mich. He was formerly associated with Oliver Corp as general superintendent of the Outboard Division. **George Diggles** has been named manager of production engineering at Hydreco. **Frank P Szamier** has been named chief inspector.

Henry G Haynes has been named president of B C Ames Co, Boston manufacturer of indicators and gages. Former treasurer, he succeeds the late **Warren Ames. Bliss C Ames** and **Warren Ames Jr** have been elected vice presidents.

Robert H Quale Jr has been named executive vice president of the Norge Division of Borg-Warner Corp.

Philip W Scott, formerly administrative vice president of the Byron Jackson Division of Borg-Warner Corp, has joined the Budd Co, Philadelphia, as a group vice president with supervision over four of the company's divisions.

Harold A Weiss has been named chief tool engineer of Warner Electric Brake & Clutch Co, Beloit, Wis. He was formerly chief engineer at C W Smith Engineering Co, Detroit.

Clifford A Sharpe has been appointed senior vice president of American Bosch Arma Corp, Hempstead, NY. He had been vice president, operations.

Herchel M Richey has been elected vice president, manufacturing, of the Roller Bearing and Rock Bit Divisions of Timken Roller Bearing Co, Canton. Formerly general factory manager, he succeeds **A M Donze** who has retired

Carter C Higgins, Worcester (Mass) Pressed Steel Co, has been elected president of the Pressed Metal Institute. Vice presidents are **F F Rimmler,** Volkert Stampings, Inc, Queens Village, NY; and **M A Sherwood,** Grand Haven Stamped Products, Grand Haven, Mich.

Van R French has been appointed production manager of Jamesbury Corp, Worcester, Mass, manufacturer of ball valves and hydraulic devices.

Daniel O'Madigan Jr has been named general sales manager of the new Automotive and Agricultural Parts Division recently established by Saco-Lowell Shops, Boston. Mr O'Madigan was formerly director of sales for Studebaker-Packard Corp.

Dr Ernst H Krause has been appointed vice president and general manager of the Aeronutronic Computer Division of Aeronutronic Systems, Inc, west coast subsidiary of Ford Motor Co. **Dr Montgomery H Johnson** has been named director of the office of advanced research, and **Dr Joseph V Charyk** is general manager of the Space Technology Division of the company. **Roy P Jackson** has been appointed general manager of the Tactical Weapon Systems Division, and **Arthur C Haines** has been named assistant to the president.

Nelson G Spoth has been named manager of Kolcast Industries, a division of Thompson Products, Cleveland. Mr Spoth succeeds **Lewis R Schilling,** founder of Kolcast, who has resigned to become president of Gerson Stewart Corp, Cleveland in-

Both NEW *and* DIFFERENT SHELDON 15" PRECISION LATHES

ER60P
5' bed—
31" centers

NEW

New. Revolutionary double-box Headstock (Pat. Pend.)

New. "WORK-HOLDING-ONLY" Spindle.

New. Single-Shift Back Gear Lever on Headstock.

New. Headstock and Apron running in oil.

New. 1⅛" Hole through Spindle.

New. 60-pitch Gear Box with built-in Lead Screw Reverse.

New. Amazing LOW PRICE.

$2350.00
base price
F.O.B. Factory
(Less Electricals)

DIFFERENT

Different. Spindle rigidly held in two large "Zero Precision" tapered roller bearings arranged in new box-type design.

Different. Electrical switches and push-button stations fully enclosed in built-in well in headstock.

Different. Two independent clutches in apron for selecting power feeds.

Different. Cam-action tailstock clamp for rapid release and instant locking of tailstock.

Different. Triple, cogged, V-belt outboard drive—eliminates intermediate shafts—delivers more power to spindle.

This is an all new lathe that bridges the gap between conventional belt driven and geared head lathes. It combines the capacity and power of a geared head with the economy and flexibility of a belt driven lathe. Available with 5', 6' and 8' bed lengths providing 31", 42" and 66" center distances.

Send in Coupon for full information

SHELDON MACHINE CO., INC. 4234 No. Knox Ave., Chicago 41, U.S.A.

Gentlemen: Please send me information on items checked.

- ☐ The NEW and DIFFERENT SHELDON 15" Lathes
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NAMES IN THE NEWS...

dustrial chemical firm. **Harold D Blake** has been appointed chief engineer at Kolcast. He was formerly supervisor of engineering with the Kolcast-Tapco group. **Fred Dischinger,** chief engineer, has been named manager of the Minerva, Ohio, plant.

Raymond W Heimsoth has been elected president of Ess Instrument Co, Bergenfield, NJ, manufacturer of electronic instruments and special devices for automation and general industry. Formerly vice president and chief engineer of the company, Mr Heimsoth succeeds **Col C C Sheppard** who is retiring. **Eugene Ross** has been appointed vice president, sales.

John G Brooks, president of Siegler Corp, Los Angeles, has been named to the board of directors of the Electronic Industries Association, national group representing major manufacturers of electronic equipment, with headquarters in Washington, DC.

Geoffrey R Simmonds has been made president of Simmonds Aerocessories, Inc, Tarrytown, NY. He succeeds the late **William R Enyart,** president since 1940. Mr Simmonds has been vice president of Simmonds Aerocessories of Canada, Ltd, Hamilton, Ont, for the past 5 years.

Robert F Meyers has been named assistant plant manager in charge of operations for the Bay Manufacturing Division of Electric Auto-Lite Co's General Products Group. He was previously manager of manufacturing facilities and methods.

Kenneth P Martin, formerly associated with LeMaire Machine Tool Co, has joined Sunnen Products Co of St Louis as industrial sales manager.

Benjamin Z Ranan has been made director of manufacturing for Taller & Cooper, Brooklyn, NY, subsidiary of American Electronics, Inc, Los Angeles. Company makes data processing, industrial instrumentation, and automation systems.

Joseph B Black, operations division manager, Hiller Aircraft Corp, Palo Alto, Calif, has been named vice president, operations.

Carl F Krehbiel has been named western sales manager for Ainsworth Precision Castings Co. He will make his headquarters in Chicago.

William C Robertson, formerly plant manager of Federal-Mogul Division's facility at St Johns, Mich, has been transferred to the Division's larger plant in Greenville. He is succeeded as manager at St Johns by **Kermit M Hart,** formerly superintendent there.

Albert M Nutter, treasurer of E L LeBaron Foundry Co, Brockton, Mass, has been elected president of the Gray Iron Founders' Society. **J E Quest,** president of Quest Manufacturing Co, Shakopee, Minn, is new vice president of the Society.

John F Howe Jr, formerly of the industrial sales department of Sherwin-Williams Co, has been named sales manager of Industrial Finishes Co, Philadelphia.

Joseph B Ogden has been appointed vice president, sales, of Chrysler Corp's Airtemp Division.

William S Aiken has been named manager of the project engineering department, Engineering Div, of Thompson-Ramo-Wooldridge Products Co, Los Angeles.

Thomas Earl Douglass has been appointed assistant to the president of Simonds Worden White Co, Dayton, Ohio, manufacturer of grinding wheels and knives.

Robert S Wright has been named president of USI International, a division of US Industries, Inc, which specializes in worldwide exporting of heavy machinery and equipment made by leading American and foreign manufacturers. Mr Wright has been general manager of the Winchester International Division of Olin Mathieson Co for the past seven years.

OBITUARIES

Clarence M Allen, 77, president of the Chas G Allen Co, Barre, Mass, manufacturer of drilling and tapping machines, died Sept 17 in Cleveland. Mr Allen was associated with Strong, Carlisle & Hammond Co for 50 years; he also founded and was co-owner of the Hammond Manufacturing Co, Cleveland maker of machine tools. At the time of his death he was associated with Tri-State Machinery Inc, distributors of Allen machine tools.

Paul B Pew, 60, executive vice president of the Linde Air Products Division of Union Carbide Corp, died Oct 9 in New York. Associated with the company for 35 years, Mr Pew was in charge of production, sales, and research activities.

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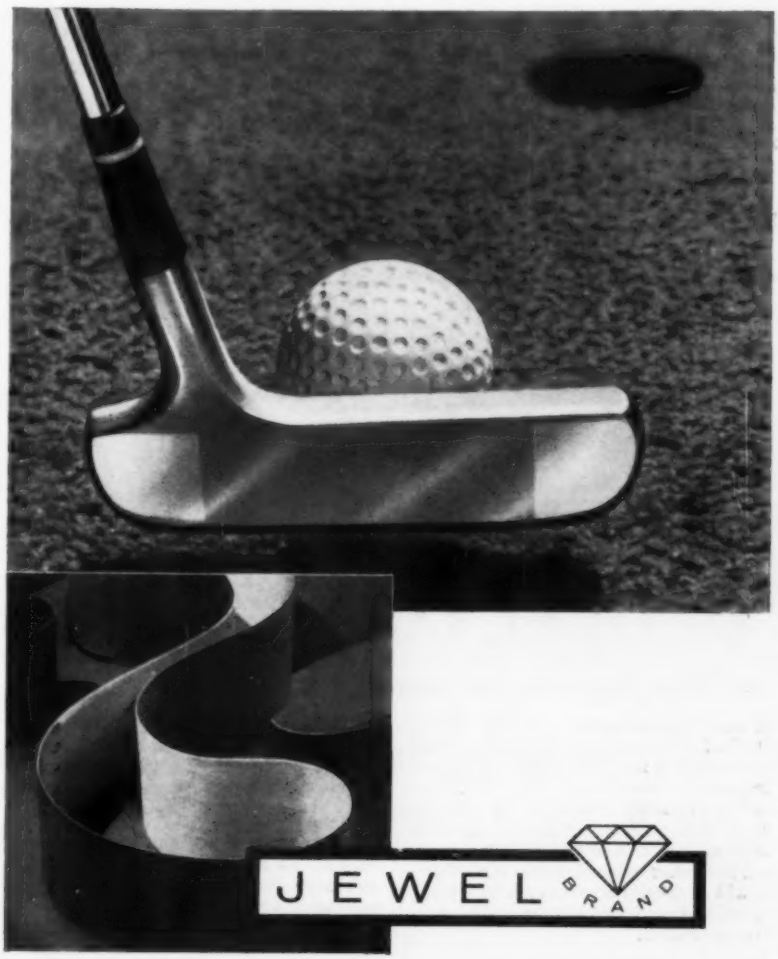

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Inspection with the Nikon Optical Comparator is simply a matter of comparing the magnified image of the part under inspection with a master chart of a drawing affixed to the viewing screen. Precise measurements can be made of the most intricate contours—at a glance—by operators with comparatively little training. Further, accurate inspection of surface details and finishes can also be made. Thanks to Nikkor optics, the image is so bright and of such high resolution, that the entire inspection may be carried on in any normally well-lit room. And it can be viewed by several people at the same time.

So precise is the Nikon Comparator, that its use has enabled plants to enter into high-precision fabrication, and to achieve tolerances not available by any other methods. The Nikon Bench Model II can be easily carried from one part of the plant to another, for on the spot inspections and measurements, reducing "down time." Photo records of the image can be made in black and white or color.

It will pay you to investigate how a Nikon Optical Comparator can improve the cost-competitive picture of your organization. For complete details, write to: Nikon Incorporated, 251 Fourth Ave., New York 10, N. Y. Dept. AM-11.

NEW FILMS...

FORGING IN CLOSED DIES. *Produced by Drop Forging Association, 1128 Illuminating Bldg, 55 Public Square, Cleveland 13, Ohio. 16 mm, color, sound. Running time 27½ min. No charge.*

Here is the complete and authoritative story of modern forging methods. It explains each kind of forging process, the design and making of dies, the variety of metals used and their selection, and the wide variety of products produced by forging. The properties imparted to metal by the forging process are described.

•

HIGH-PRECISION BORING HEADS. *Produced by Briney Mfg Co, 1165 Seba Road, Pontiac, Mich. Film strip, sound, color. Running time 11 min. No charge.*

Suitable for showing to technical groups interested in new tooling methods and applications, this film can also be adapted to training machine operators in the proper use and maintenance of the Briney boring head which can be adjusted in increments smaller than 0.0001 in.

•

ENGINEERING NOTEBOOK. *Produced by Western Electric Co, 195 Broadway, New York 7, N Y. 16 mm sound, color. Running time 20 min.*

This film was made both for in-company and outside distribution, because it covers production developments that deserve wider acceptance within Western Electric's many production facilities as well as recognition from outside the Bell System.

One of the most important points of the film is that WE has applied automation principles for many years, as illustrated by Tape-O-Matic tests applied automatically to equipment and paper pulp applied as insulation to wire. Automated capacitor-making machines dating from 1925 are shown, too.

Also illustrated are a number of recent developments: a percussion-welding setup for joining wires, a machine that assembles telephone transmitter buttons, and equipment for spring relays, magnetic switches, and printed wiring boards.

Most examples are covered in short order, but the aim has been to present ideas for applications elsewhere—within the company and outside.

Finish obtained in machining REX M-2-S eliminates the need for finish grinding this 4" x 4" unground double thread cutting hob.

Hobs seldom need finish grinding when made of low cost REX M-2-S

This is the actual finish obtained – without costly finish grinding – with REX M-2-S,® Crucible's *sulfur-bearing*, tungsten-molybdenum type high speed steel. The chemistry of this resulfurized steel readily provides the machinability needed for the final, critical "backing-off" operation in making hobs. It doesn't tend to tear or produce rough finishes – as nonsulfur-bearing steels of this type so often do.

REX M-2-S costs about 30% less than T-1 types, too, because it's lower priced per pound, and provides 5.4% more linear feet per pound.

Crucible REX M-2-S is also equal in red hardness to the T-1 types, and even more resistant to abrasion. It's also tougher than any other tungsten type high speed steels, and hardenable over a wider range than any other molybdenum high speed steels.

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For further information, just ask for details on REX M-2-S – or all the Crucible high speed steels today. Write: *Crucible Steel Company of America, Dept. TK01, The Oliver Building, Mellon Square, Pittsburgh 22, Pa.*

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Amazing in performance, outstanding for durability . . .

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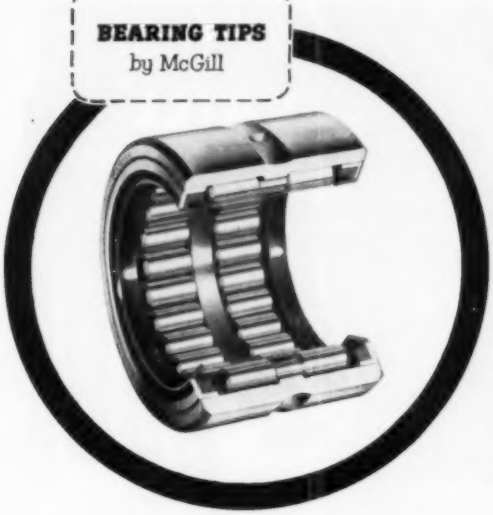
by McGill



McGILL sealed GUIDEROL® bearings preserve high capacity performance of needle bearing applications

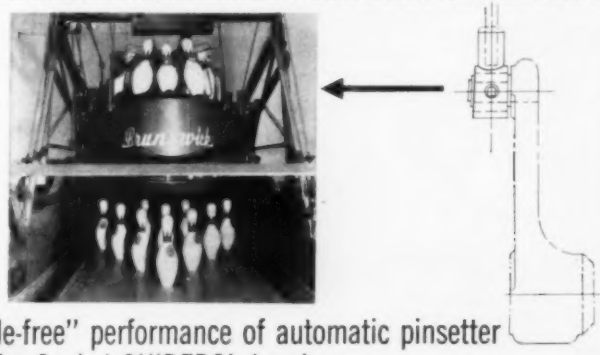
Lip type contact seals built into GUIDEROL bearings insure longer life for their high capacity performance in limited radial space. It's simpler and less costly to apply these sealed bearings than build in auxiliary seals that increase bearing width and housing requirements.

GUIDEROL bearings, including the sealed series, are precision built and combine the inherent high capacity of full complement roller bearings with the control of center guided rollers. This recommends the bearing for applications too heavily loaded for retainer type bearings, but where shaft deflection and misalignment prevents the use of ordinary full type roller bearings.

Seals keep contamination out and lubrication in. This assures trouble free performance where maintenance is costly or impractical.

Sealed GUIDEROL minimizes torque in ACF "Piggy-Back" trailer hitch

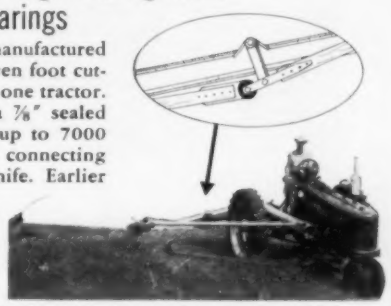
McGILL Sealed GUIDEROL bearings meet the requirements of a high capacity needle bearing for small radial space, having adequate seals to prevent entry of foreign materials and loss of lubricant in this exposed application. The bearings, in the elevating arms, minimize the amount of torque required to elevate the trailer hitch and jack the trailer off the car floor. The hitch, manufactured by American Car and Foundry Division of ACF Industries Incorporated, is a tiedown and cushioning unit for semi-truck trailers on flat car (Piggy-back) use. Although speeds are low, loads are as high as 20,000 lbs. per bearing. Grease relubrication when desired is applied through the shaft to the inner race of the bearing.



"Trouble-free" performance of automatic pinsetter called for Sealed GUIDEROL bearings

Prelubricated and Sealed GUIDEROL bearings are used in two applications in BRUNSWICK AUTOMATIC PINSETTERS; on the Rake Crank Lever Assembly and on the Jogger Arm Assembly. The photo shows the location of the sealed GUIDEROL Rake Crank Lever application in the "mechanical brain" of the machine. The sealed GUIDEROL bearings help keep the "brain" highly efficient, with a minimum of maintenance. In the Rake Crank they are not relubricated and operate indefinitely on retained lubricant. Effective seals keep out dirt and foreign matter.

New mower design takes high cutting loads on Sealed GUIDEROL bearings



These unusual field mowers manufactured by Kosch Mfg. Co. use two seven foot cutting bars for a 14 foot cut with one tractor. The second bar depends on a ⅞" sealed GUIDEROL bearing to carry up to 7000 pound loads produced in the connecting drive for the reciprocating knife. Earlier sleeve and lower quality needle bearings were discarded for sealed GUIDEROL bearings that have prevented costly field breakdowns.

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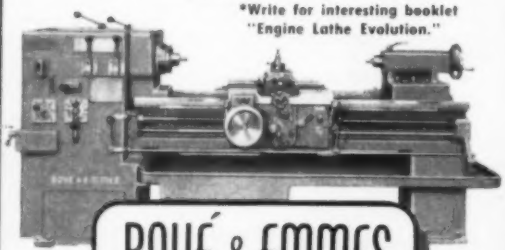

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Photo by Peter Gowland for Threadwell Tap & Die Company, Greenfield, Mass.

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shape and form tube ends
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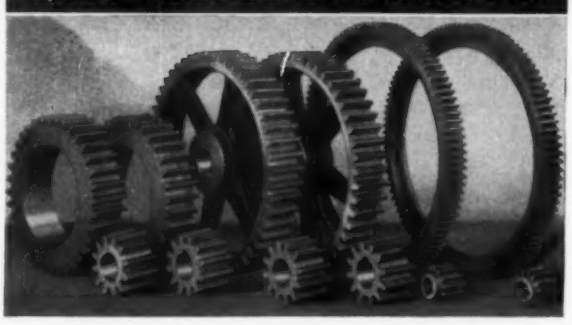

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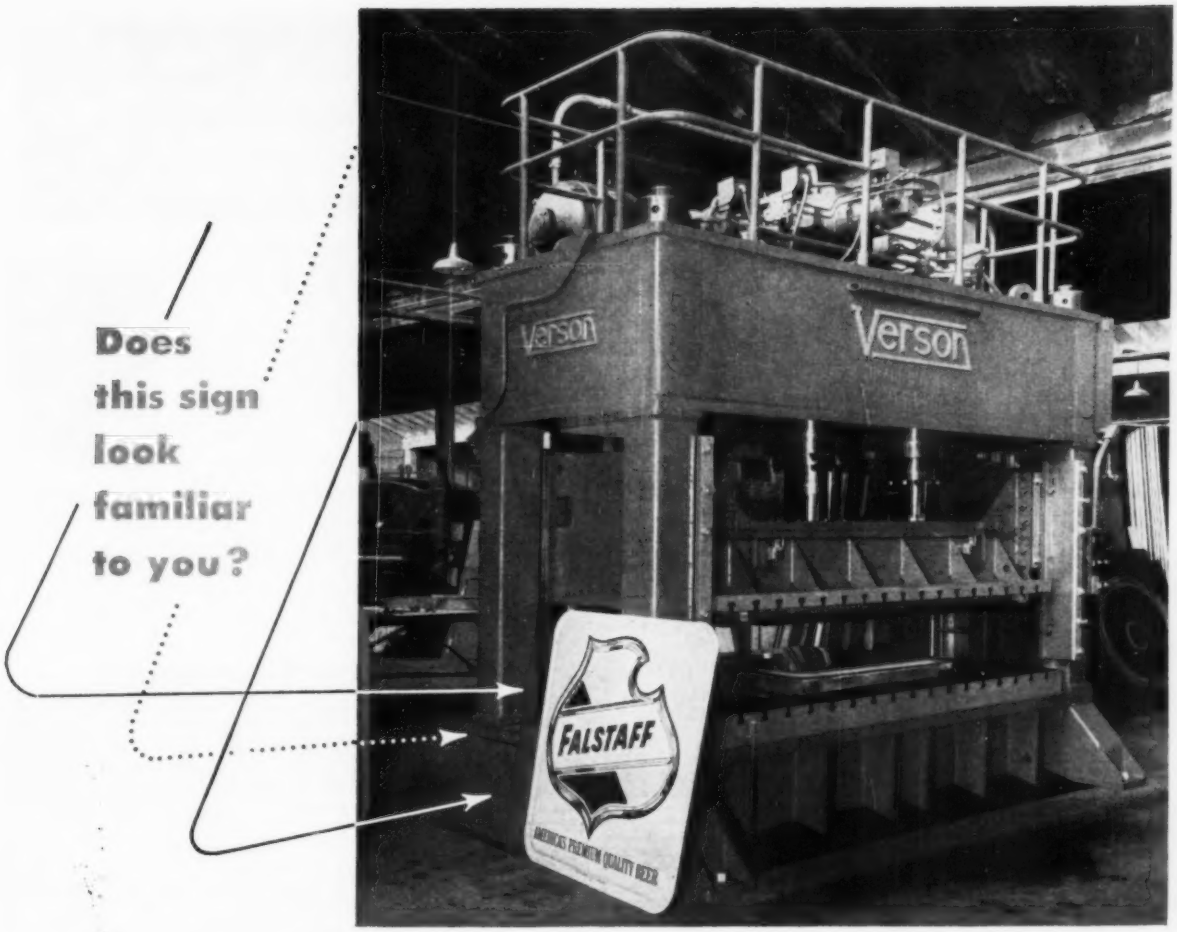

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The Grace Sign and Mfg. Co., St. Louis, Missouri, has been producing quality baked enamel signs for 45 years. An excellent example of their workmanship is a Falstaff Beer sign shown here with the 400 ton Verson Press used to emboss it.

Three background coatings and 5 printed colors are applied to the 22 gauge steel sign blank. The Verson Press, equipped with special rubber dies, then embosses the sign in a domed shape to a depth of 3½ inches. This provides rigidity and produces pleasant color highlights. Use of the rubber dies prevents any damage to the sign finish during embossing.

The press is a three cylinder, shrouded post design with a large platen area, 54″ x 108″. Stroke of the platen is 24″. Bolster area measures 60″ x 108″. Fast advance is 430″ per minute and pressing speed is 39″ per minute. Height of the press is 147″, so designed because of low ceiling height; floor space is 120″ x 137″ and the machine weighs 80,000 pounds.

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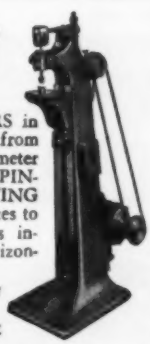

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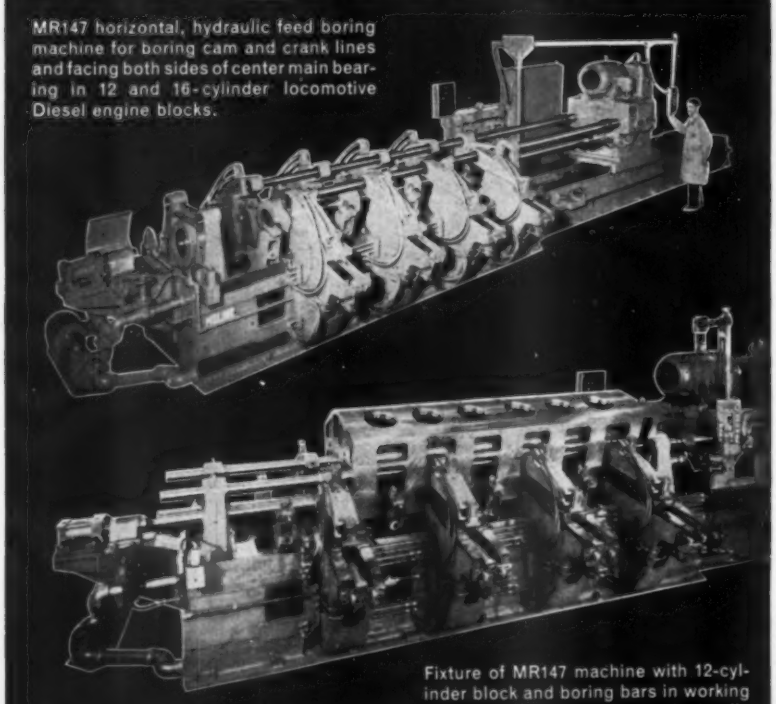

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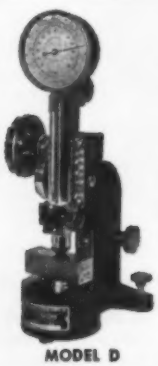

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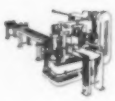

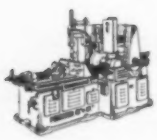

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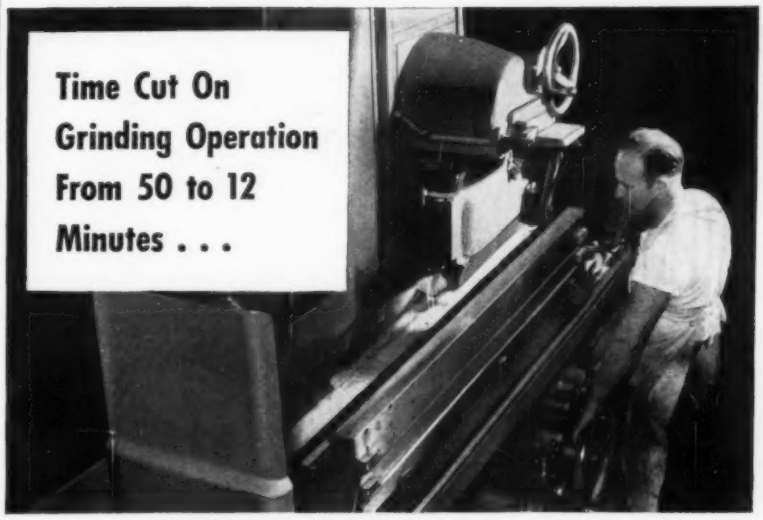

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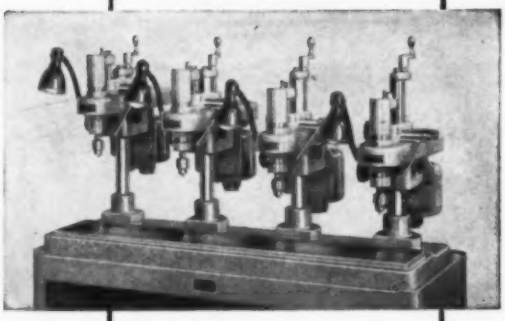

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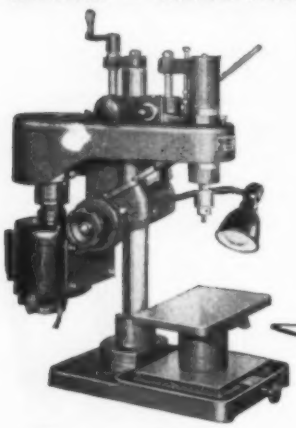

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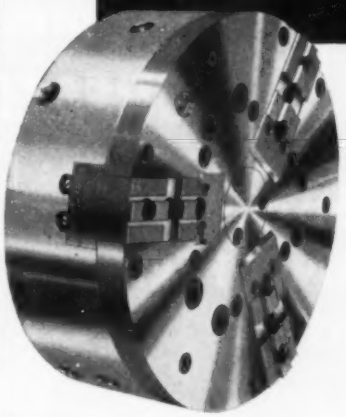

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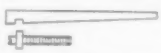
Wear take-up features will *triple* its useful *precision life*, compared with conventional chucks. 40% weight saving increases efficiency and cuts machine wear.

Send for complete details. More than ever—"It pays to chuck with Buck".



Simple, sound, practical! Two tapered gibs under each jaw, working on tapered keyways, can be tightened to preserve original accuracy and eliminate the jaw rocking that develops "bell-mouthing". Jaws are 40% lighter for less centrifugal effect, better gripping at high speeds. One piece hardened front plate eliminates distortion, can be re-ground in your own shop.

BUCK TOOL COMPANY

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COMPLETE LINE OF BUZZER REG. U.S. PAT. OFFICE BURNERS FOR CLEANING, RINSING, PICKLING AND SUNDRY HEAT OPERATIONS

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You get a lot of machine for your money in any of these three popular Covel hand-feed surface grinders.

- Hardened and precision ground lead screws
- Timing belt drive
- Hard chrome table ways
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These and many other quality features pioneered by Covel make Covel your best buy.

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2	24	46	68	90	112	134	156	178	200	222	244	266	288	310	332	354	376	398	420	442
3	25	47	69	91	113	135	157	179	201	223	245	267	289	311	333	355	377	399	421	443
4	26	48	70	92	114	136	158	180	202	224	246	268	290	312	334	356	378	400	422	444
5	27	49	71	93	115	137	159	181	203	225	247	269	291	313	335	357	379	401	423	445
6	28	50	72	94	116	138	160	182	204	226	248	270	292	314	336	358	380	402	424	446
7	29	51	73	95	117	139	161	183	205	227	249	271	293	315	337	359	381	403	425	447
8	30	52	74	96	118	140	162	184	206	228	250	272	294	316	338	360	382	404	426	448
9	31	53	75	97	119	141	163	185	207	229	251	273	295	317	339	361	383	405	427	449
10	32	54	76	98	120	142	164	186	208	230	252	274	296	318	340	362	384	406	428	450
11	33	55	77	99	121	143	165	187	209	231	253	275	297	319	341	363	385	407	429	451
12	34	56	78	100	122	144	166	188	210	232	254	276	298	320	342	364	386	408	430	452
13	35	57	79	101	123	145	167	189	211	233	255	277	299	321	343	365	387	409	431	453
14	36	58	80	102	124	146	168	190	212	234	256	278	300	322	344	366	388	410	432	454
15	37	59	81	103	125	147	169	191	213	235	257	279	301	323	345	367	389	411	433	455
16	38	60	82	104	126	148	170	192	214	236	258	280	302	324	346	368	390	412	434	456
17	39	61	83	105	127	149	171	193	215	237	259	281	303	325	347	369	391	413	435	457
18	40	62	84	106	128	150	172	194	216	238	260	282	304	326	348	370	392	414	436	458
19	41	63	85	107	129	151	173	195	217	239	261	283	305	327	349	371	393	415	437	459
20	42	64	86	108	130	152	174	196	218	240	262	284	306	328	350	372	394	416	438	460
21	43	65	87	109	131	153	175	197	219	241	263	285	307	329	351	373	395	417	439	461
22	44	66	88	110	132	154	176	198	220	242	264	286	308	330	352	374	396	418	440	462

INSIDE FRONT COVER — INSIDE BACK COVER — BACK COVER

UNKEYED AD

Name_____

Title_____

Company Name_____

Address_____

City, State_____

Circled No.	Product	*

(These are KEY numbers, not page numbers)

1	23	45	67	89	111	133	155	177	199	221	243	265	287	309	331	353	375	397	419	441
2	24	46	68	90	112	134	156	178	200	222	244	266	288	310	332	354	376	398	420	442
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10	32	54	76	98	120	142	164	186	208	230	252	274	296	318	340	362	384	406	428	450
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14	36	58	80	102	124	146	168	190	212	234	256	278	300	322	344	366	388	410	432	454
15	37	59	81	103	125	147	169	191	213	235	257	279	301	323	345	367	389	411	433	455
16	38	60	82	104	126	148	170	192	214	236	258	280	302	324	346	368	390	412	434	456
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19	41	63	85	107	129	151	173	195	217	239	261	283	305	327	349	371	393	415	437	459
20	42	64	86	108	130	152	174	196	218	240	262	284	306	328	350	372	394	416	438	460
21	43	65	87	109	131	153	175	197	219	241	263	285	307	329	351	373	395	417	439	461
22	44	66	88	110	132	154	176	198	220	242	264	286	308	330	352	374	396	418	440	462

INSIDE FRONT COVER — INSIDE BACK COVER — BACK COVER

UNKEYED AD

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Title_____

Company Name_____

Address_____

City, State_____

Circled No.	Product	*

more data?

it's easy

1. Circle Key Number(s) on these cards that correspond(s) to number(s) at bottom of advertisement(s), new equipment item(s) or catalog(s) offered

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3. Tear Off and Mail . . . We'll do the rest

On ad pages in which more than one product is advertised, circle key number and indicate in the box marked with an asterisk(*) number(s) and specific product(s) on which you want further details

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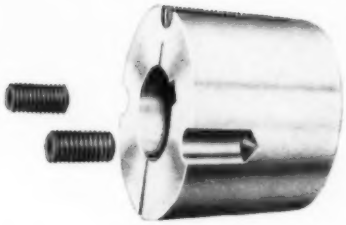

TAPER-LOCK Bushings are *Interchangeable!*

Change from shaft to shaft				
Change from size to size				
Change from sheaves to sprockets to couplings to conveyor pulleys				

Save Time!

There's nothing like Taper-Lock for mounting wheels on shafts! First, you get off-the-shelf convenience. No reboring, no machining, no waiting!

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You get the holding power of a shrunk-on fit with minimum effort. Product and bushing slip on the shaft as a unit. Tighten the screws—and you're set!

Save Money!

You save big money by minimizing down-time with *quick* changes. And interchangeability minimizes inventory. Note that all of the above installations are handled with a total of only four Taper-Lock bushings!

DODGE

of Mishawaka, Ind.

CALL THE TRANSMISSIONEER—your local Dodge Distributor. Factory trained by Dodge, he can give you valuable help on new, cost-saving methods. Look in the *white* pages of your telephone directory for "Dodge Transmissioneer".

DODGE MANUFACTURING CORPORATION, 100 Union St., Mishawaka, Ind.

Radical new concept in handling bearings speeds shipping

Helps you 6 ways when you buy Timken® bearings

To give you faster, better service when you buy Timken® tapered roller bearings, the Timken Company has developed a revolutionary new concept in warehousing, order processing and shipping. All the elements of the system converge at our huge new $3,000,000 Shipping Center in Bucyrus, Ohio, that enables us to get your bearings out faster and more dependably than ever before. It helps you in six important ways.

1. Reduces time required to process your bearing order. The new system, which uses the electronic computer, enables us to give you an acknowledgment and shipping date on most orders within 24 hours. **2. Cuts shipment and invoice preparation time.** Makes things easier for your purchasing department.

3. Your order comes completely from one shipping point. Single source handling further speeds your bearing shipment. **4. Your orders having the same shipping date are consolidated.** Increases handling efficiency at your plant when you receive your Timken bearings.

5. The new system helps assure delivery when promised, because it controls our production to meet your needs. **6. It gives you a practically** unlimited source of supply for tapered roller bearings, from our normal warehouse inventory of over 12 million bearing cones and cups.

And the IBM Computer (grid of which is shown above) is the system's heart. It integrates the Shipping Center with all our production facilities—controls the system which speeds order processing and keeps our production in line with your needs. This totally new concept in customer service is one more reason why you get your No. 1 bearing value when you buy Timken bearings. The Timken Roller Bearing Company, Canton 6, Ohio. Canadian plant: St. Thomas, Ontario. Cable address: "TIMROSCO".

BETTER-ness rolls on

TIMKEN®

tapered roller bearings